

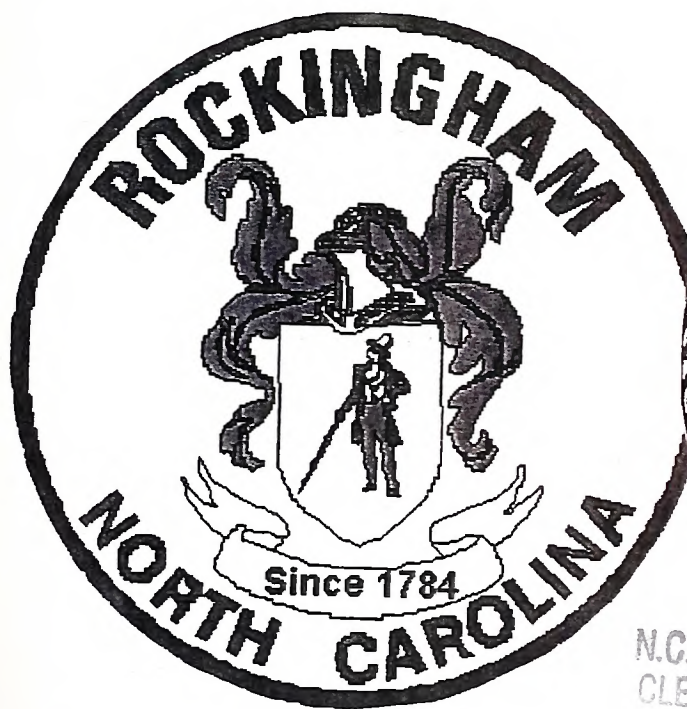
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*North Carolina Department of Transportation
Division of Highways
Statewide Planning Branch*

THOROUGHFARE PLAN FOR THE CITIES OF ROCKINGHAM-HAMLET



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1996 THOROUGHFARE PLAN

FOR

ROCKINGHAM & HAMLET, NORTH CAROLINA

Prepared By:

The Statewide Planning Branch
Division of Highways
North Carolina Department of Transportation

In Cooperation With:

The Cities of Rockingham & Hamlet
Richmond County

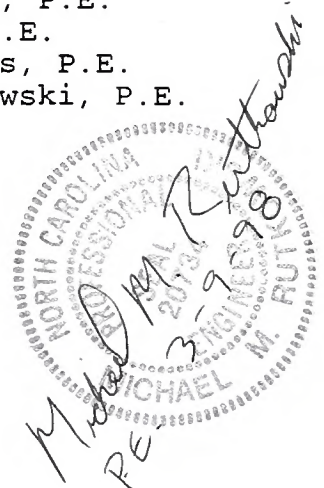
The Federal Highway Administration
United States Department of Transportation


January, 1998

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EXECUTIVE SUMMARY

In October 12, 1993 the City's of Rockingham and Hamlet contracted with the North Carolina Department of Transportation (NCDOT) to perform a Thoroughfare Planning Study for the Area. This new study would update a previous plan adopted in December 1979.

To begin the study, base year data and future socio-economic projections were developed by the Rockingham and Hamlet Planning Departments and NCDOT. This data was used to develop and simulate traffic for the base year 1994 and design year of 2020.

After calibrating the base year network, the study focused on design year travel forecast and deficiencies. The work included testing the future alignment of the US 74 Bypass (TIP #: R-512) and the US 1 Bypass (TIP #: R-2501). It also included the proposed I-73 Corridor.

Several informal meetings were conducted with the representatives of both municipalities throughout the study to discuss transportation issues as well as the local ideas for relieving the traffic problems within the planning area. Six meetings were conducted with local planning staffs, elected officials, and the public including two public hearings as a part of the planning process.

In December 1994 and August 1995, two Planning Board meetings were conducted with Hamlet and Rockingham to discuss the thoroughfare planning process. The meetings allowed each community to address local traffic problems and needs.

Additional Planning Board meetings were held in February and March, 1996 with the Cities of Hamlet and Rockingham. The topics of discussion focused primarily on capacity problems and recommendations for improvements. Other items of discussion included the comparison of alternative corridor alignments for the US 1 Bypass. At the time, the US 1 project had undergone an environmental assessment as part of the project development stage of the TIP process.

On April 3, 1996 the Hamlet City Council conducted a Public Hearing to include additional public comment with regard to the Thoroughfare Plan. The discussion focused on the proposed Hamlet one way pair (see Chapter V for purpose and need assessment). After a lengthy discussion, the City Council voted unanimously to adopt the Thoroughfare Plan.

A Public Hearing was conducted by the Rockingham City Council on May 14, 1996. The meeting allowed for additional public comments on the Thoroughfare Plan. As a result, the Plan was unanimously endorsed.

The Statewide Planning Branch, NCDOT would like to thank Mr. James Armstrong, Rockingham City Planner, Mr. Lee Matthews, Hamlet City Manager, and Mrs. Lisa Vierling, Hamlet City Clerk for their assistance toward the completion of this study.

I. INTRODUCTION

A proper functional transportation system will provide the means for fast, convenient, and safe transportation of people and goods from one place to another. It is imperative that the system not only meet existing travel demands, but also that it provide for regional growth. This report documents the thoroughfare plan study for the Cities of Rockingham and Hamlet. Its objective is to provide a system of thoroughfares to serve the existing and future traffic needs of both communities for the next twenty-six years.

This report documents the data collection, mathematical modeling for trip generation and distribution, and projection of socio-economic data to the design year of 2020. The report also describes the procedures used to arrive at a recommended thoroughfare plan. It includes alternative plans, environmental impacts, capacity deficiencies, design year traffic volumes, and the recommended plan; as well as other modeled plans and strategies which help the end product to be as efficient, safe, environmentally acceptable, and economically sound as possible. Several published documents including: Annexation Study Rockingham (1977); Rockingham Community Facilities Plan and Public Involvement Program (1970); Rockingham Land Development Plan (1974); Rockingham Housing Element (1978); East Washington Street - Commercial Area Study (1976); Rockingham Community Appearance and Recreational Study (1976); Hamlet Housing Element (1971); Hamlet Land Development Plan (1977); Hamlet Community Facilities Plan (1970); were used as a reference for establishing historical trends and development patterns for the planning area.

The proposed system of thoroughfares were developed following the basic principles of thoroughfare planning as described in Chapter 1 of the supplemental handout, "Generalized Chapters for Thoroughfare Plan Reports. Thoroughfares were located based upon field investigation, existing and anticipated land use and population distribution, and topographic conditions. The plan advocates those improvements which are felt to be essential for proper traffic circulation within the current planning period (1994-2020).

Initiative for plan implementation will rest largely with the policy boards and citizens of the area. The scope of highway needs throughout the State greatly outweigh the available funding. It is, therefore, necessary that the local areas aggressively pursue funding for desired projects.

The proposed thoroughfare plan is based on the anticipated growth of Rockingham and Hamlet, and the surrounding area as described in this report. It is possible that the actual growth patterns differ somewhat from those logically anticipated. As a result, it may be necessary to accelerate or retard the implementation of some portions of the plan and/or make revisions which will accommodate unexpected changes in urban development.

GEOGRAPHIC LOCATION FOR ROCKINGHAM-HAMLET, N.C.

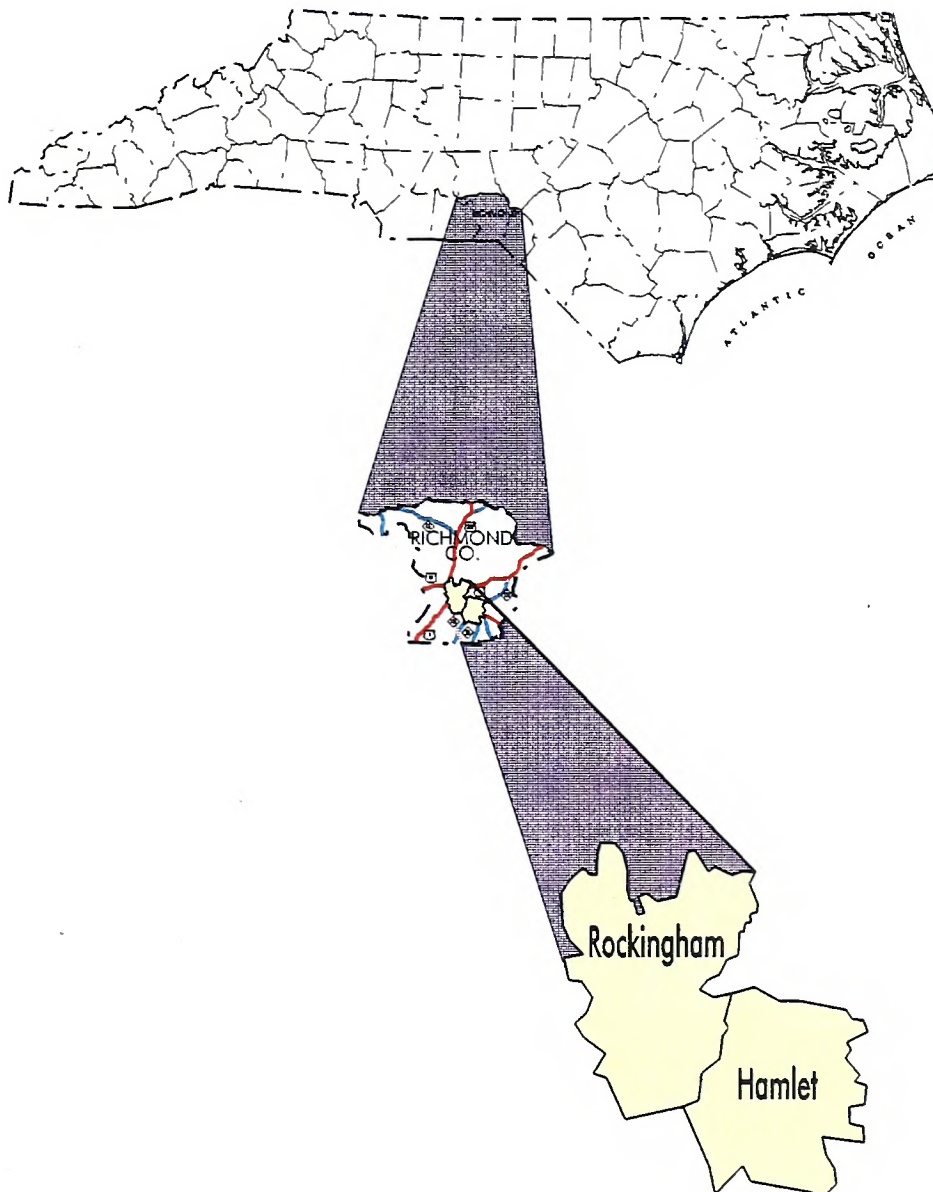


FIGURE 1

II. RECOMMENDATIONS

The Thoroughfare Plan resulting from this study is shown in **Figure 2**. This plan provides for a system of major and minor thoroughfares, which, when progressively implemented, should accommodate the expected travel desires and anticipated land development within the planning period. **Appendix C** of this report includes a street by street description of the thoroughfare system with the associated traffic volumes. A proposed construction plan for Rockingham and Hamlet is shown in **Figure 3**.

This plan is a revised version of the November, 1979 Thoroughfare Plan. The recommended revisions are based on the results of a traffic forecast model that uses data on traffic counts, population, housing, employment, and vehicle ownership to simulate travel (**See Chapter VIII**). With this model each major street and highway in the planning area is analyzed to determine its ability to serve existing and future traffic demands. In the development of an updated thoroughfare plan some proposals from the old thoroughfare plan have been retained, some were found inadequate for current problems and were deleted, and some new proposals were added. The following is a description of the Major and Minor Thoroughfares for the Rockingham/Hamlet Planning Area.

Freeway/Expressways:

- * **US 74 Bypass (TIP#: R-512, new location):** This proposed 4-lane divided, controlled access facility runs from existing US 74 in the western section of the planning area to Grace Chapel Church Road/US 74. The recommendation is to route this facility south of Rockingham and Hamlet to facilitate through trip and local traffic. This proposed facility will provide relief to existing US 74 by removing through trip traffic and by providing for proper circulation of traffic within the planning area.
- * **US 1 Bypass (TIP#: R-2501, new location):** The purpose of this proposed multi-lane facility is to relieve the existing congestion problems along US 1 through Rockingham. The facility also provides north-south traffic circulation for Rockingham. Construction of the controlled access facility is scheduled for 2005.
- * **I-73/74 Corridor (TIP#: R-3421, new location):** This proposed 4-lane divided facility is currently under feasibility.

Rockingham Major Thoroughfares:

- * **US 1 (TIP#: U-3456 & R-2501)** from Lawson Lane to northern planning boundary and from US 1 Bypass to the southern planning boundary. This proposed multi-lane facility will provide the necessary capacity to relieve the current congestion along this corridor. Right-of-way acquisition is scheduled to begin in 2003.
- * **US 220 (TIP#: U-2583)** from the proposed US 74 Bypass to Forrest Street. This section of US 220 is over-capacity. Widening of this facility is scheduled to begin in the year 2000. All other sections of US 220 within the planning area are multi-lane and do not require improvements.
- * **US 220** from the northern planning boundary to US 74. No improvements are necessary.
- * **Aberdeen Road (SR 1426)** from SR 1424 to Philadelphia Road. No improvements are necessary.
- * **Airport Road (SR 1966)** from the southern planning boundary to US 1. Airport Road serves as a radial carrying traffic from NC 177 into the planning area. It also provides access to the Rockingham-Hamlet Airport. A 4-lane divided cross-section is proposed from Sandhill Road to NC 177.
- * **Beaunit Avenue (SR 1903)** from Mill Road to Hylan Drive. Beaunit Avenue also serves as a bypass of US 74 for local traffic. Development along this corridor limit the opportunity for improving capacity. A 5-lane cross-section is preferred, however, right-of-way limitations restrict widening to a 4-lane cross-section.
- * **Billy Covington Road** from Northam Road to US 220. No improvements are necessary.
- * **Biltmore Road (SR 1925)** from Beaunit Avenue to US 74. This connector facility serves as a primary connection between Hylan Drive and US 74. It is currently over-capacity. A 3-lane cross-section is recommended with the center lane providing for left turns.
- * **Caroline Avenue** from Greene Street to US 1. No improvements are necessary.
- * **Clemmer Road** from US 74 to County Home Road. No improvements are necessary.
- * **County Home Road (SR 1624)** from Long Drive to NC 177. No improvements are necessary.

- * **Eason Drive (SR 1136)** from Old Cheraw Highway to Sandhill Road. It does not meet the minimum tolerable lane width requirement and should be widened from 16' wide to a 2-lane 24' wide facility. This facility serves local traffic as an integral segment of the inner loop.
 - * **East Washington Street** from US 1 to Wire Grass Road. No improvements are necessary.
 - * **Ellerbe Road (SR 1441)** from the northern planning boundary to Ledbetter Road. No improvements are necessary.
 - * **1st Street** from Zion Church Road to Ledbetter Street. No improvements are necessary.
 - * **Greene Street** from US 1 to US 74. Greene Street provides a bypass of the Rockingham CBD. No improvements are necessary.
 - * **Hannah Pickett Street** from Mill Street to Airport Road. This facility serves local traffic as an integral segment of the inner loop. No improvements are necessary.
 - * **Ledbetter Road (SR 1442)** from SR 1489 to US 1. No improvements are necessary.
 - * **Ledbetter Street (SR 1109)** from 1st Street to Rosalyn Road. No improvements are necessary.
 - * **Long Drive (SR 1646)** from US 1 to US 74. A 5-lane widening is proposed for this facility. The additional lane will accommodate left turning movements. Long Drive is the primary facility providing access to the mall and hospital area.
- A 3-lane cross-section is proposed from US 74 to Haywood Street to accommodate left turning vehicles.
- * **McDonald Church Road** from US 1 to northern planning boundary. No improvements are necessary.
 - * **McNair Street** from US 74 to US 220. No improvements are necessary.
 - * **McNeil Road** from Nicholson Street to northern planning boundary. No improvements are necessary.
 - * **Midway Road** from US 74 to Yates Street. No improvements are necessary.
 - * **Mill Road (SR 1903)** from US 1 to Beaunit Avenue. Mill Road serves as a bypass of US 74 for local traffic, in particular, East Rockingham. Development along this corridor limit the opportunity for improving capacity. A 5-lane cross-section is preferred, however, right-of-way limitations restrict widening to a 4-lane cross-section.

- * **Mizpah Road** from US 1 to Airport Road. No improvements are necessary.
- * **Mount Olive Church Road Extension** to County Home Road. This proposed 2-lane connector would provide travellers in North Rockingham and US 1 additional access to the hospital and mall/shopping area. Rockingham Road and Long Drive, currently over-capacity, would have substantial traffic relief.
- * **Mount Olive Church Road (SR 1645)** from US 1 to East Washington Street. It does not meet the minimum tolerable lane width requirement and should be widened from 18' wide to a 2-lane 24' wide facility. This facility serves local traffic between US 1 and the mall/hospital area.
- * **Nicholson Street** from Snead Avenue to Sandhill Game (SR 1424). No improvements are necessary.
- * **Northam Road** from Billy Covington Road to Aslington Road. No improvements are necessary.
- * **Old Charlotte Highway** from US 74 to western planning boundary. No improvements are necessary.
- * **Old Cheraw Highway (SR 1103)** from Midway Road to US 1. No improvements are necessary.
- * **Park Avenue Extension** to US 1. The purpose of this 2-lane (24'-wide) facility is to allow proper circulation of traffic in north Rockingham.

The development in this area including the new Food Lion will require this connector to be shifted north, adjacent to Lawson Lane. This shift in the alignment would allow the tie-in to be made with the facility adjacent to the Food Lion.

- * **Park Avenue-Beverly Hills Church Road-Midway Road-Eason Drive-Hannah Picket Avenue Loop.** This proposed 2-lane loop would utilize existing 2-lane facilities to create an inner loop for the Rockingham area. This project would improve circulation of local traffic.
- * **Patterson Road** from East Washington Street to US 1. No improvements are necessary.
- * **Philadelphia Road** from Aberdeen Road to US 1. No improvements are necessary.
- * **Prison Camp Road** from Kings Road to US 74. No improvements are necessary.
- * **Quarry Road** from Midway Road to Zion Church Road. No improvements are necessary.

- * **Quarry Road Extension.** It is proposed that Quarry Road be extended to Yates Mill Road to correct the offset intersection.
- * **Richmond Road (SR 1423)** from Ledbetter Road to US 1. This facility serves local traffic accessing US 1 and Long Drive. Currently, it has a 2-lane, 22' wide cross-section. No improvements are necessary.
- * **Rockingham Road (SR 1648)** from Franklin Street to US 74. Rockingham Road serves traffic between the CBD and the mall area. A 5-lane cross-section is recommended with the center lane providing for left turns.
- * **Rosalyn Road** from Ledbetter Street to Mizpah Road. No improvements are necessary.
- * **Sandhill Game Road (SR 1424)** from northern planning boundary to Richmond Road. No improvements are necessary.

A 3-lane cross-section is recommended from Richmond Road to Fayetteville Road with the center lane providing for left turns.
- * **Snead Avenue** from US 220 to Nicholson Street. No improvements are necessary.
- * **South Church Street (SR 1927)** from Beaunit Avenue to Airport Road. No improvements are necessary.
- * **Stokes Road** from Mizpah Road to Battley Dairy Road. No improvements are necessary.
- * **Wire Grass Road (SR 1640)** from US 1 to Spring Street. Wire Grass Road serves as the primary connection between US 1 and Hamlet. This facility is not expected to experience major congestion problems within the design year horizon. However, the need for capacity improvements should be revisited if development along this corridor increases.
- * **Yates Mill Road** from the proposed Quarry Road Extension to US 74. No improvements are necessary.
- * **Zion Church Road** from US 74 to 1st Street. No improvements are necessary.

Rockingham Minor Thoroughfares:

- * **Clark Street** from Hood Street to Rockingham Road. No improvements are necessary.
- * **Hood Street** from East Washington Street to Clark Street. No improvements are necessary.

- * **Lee Street** from Greene Street to McNair. No improvements are necessary.
- * **Maness Avenue** from Lee Street to US 74. No improvements are necessary.
- * **Midway Road** from US 1 to Yates Street. No improvements are necessary.
- * **Pickett Street Extension.** This proposed 2-lane connector provides traffic relief to the mall and hospital areas by allowing direct access to East Rockingham.
- * **Roberdel Road (SR 1424)** from Richmond Road to US 1. No improvements are necessary.
- * **Steele Street** from Fayetteville Road to Aslington Road. No improvements are necessary.

Hamlet Major Thoroughfares:

- * **NC 177 Bypass** from Lewis Street to Freeman Mill Road on new location. This 4-lane divided proposal will provide relief to Marlboro Street and serve as a western bypass of Hamlet.
- * **NC 177** from the proposed NC 177 Bypass to the northern planning boundary. This facility carries traffic from the north into the City of Hamlet. By the design year of 2020, this corridor is expected to reach capacity. A 4-lane divided cross-section will provide the additional needed capacity.

NC 177 from the proposed NC 177 Bypass to the southern planning boundary. No feasible capacity improvements can be implemented.
- * **NC 38** from the southern planning boundary to US 74. NC 38 serves as a primary connection between South Carolina, US 15/401 and Hamlet. This facility is not expected to experience major congestion problems within the design year horizon. However, the need for capacity improvements should be revisited if development along this corridor increases.
- * **NC 381 Extension** to NC 177. This 2-lane proposal allows regional traffic to bypass Hamlet to the north-east. Travellers heading on US 74 from NC 177 will no longer be required to travel into Hamlet. Additionally, local traffic will have improved circulation as future development occurs near City Lake and Boyd Lake.
- * **NC 381** from the southern planning boundary to US 74. No improvements are necessary.
- * **Alexander Drive** from McDonald Avenue to Oak Avenue. No improvements are necessary.

- * **Battley Dairy Road (SR 1900)** from NC 177 to Ellerbe Grove Church Road (SR 1994). This section does not meet the minimum tolerable lane width requirement and should be widened from 16' wide to a 2-lane 24' wide facility.
- * **Cobble Road (SR 1614)** from Old Lauringburg Road to the eastern planning boundary. No improvements are necessary.
- * **Freeman Mill Road (SR 1812)** from Chalk Road to NC 38. No improvements are necessary.
- * **Gin Mill Road** from Lackey Street to Airport Road. No improvements are necessary.
- * **High Street** from Charlotte Street to Hamlet Avenue. No improvements are necessary.
- * **Hylan Road Connector to US 74.** This 2-lane proposed connector would allow Hamlet residents living south of the Seaboard Coast Line Railroad direct access to existing US 74. Presently, this traffic is forced to use Biltmore Road when traveling to the mall area. Marlboro Street is the other closest access point to US 74. Both facilities are currently over capacity. The proposal will also provide immediate access to the proposed interchange for the US 1 Bypass.
- * **Hylan Drive (SR 1909)** from Beaunit Avenue to Main Street. Hylan Drive also serves as a bypass of US 74 for local traffic. Development along this corridor limit the opportunity for improving capacity. However, a 3-lane cross-section is recommended with the center lane providing for left turns.
- * **Lackey Street** from Main Street to Gin Mill Road. No improvements are necessary.
- * **Lakeside Drive (SR 1608)** from US 74 to the eastern planning boundary. No improvements are necessary.
- * **Main Street (SR 1615)** from Hylan Drive to Perry Williams Road. No improvements are necessary.
- * **McDonald Avenue (SR 1903)** from Hylan Drive to Alexander Drive. No improvements are necessary.
- * **Oak Avenue** from Alexander Drive to Lackey Street. No improvements are necessary.
- * **Old Gibson Road** from NC 381 to East Main Street. No improvements are necessary.
- * **Old Lauringburg Road (SR 1610)** from US 74 to the eastern planning boundary. No improvements are necessary.

- * **Perry Williams Road (SR 1833)** from Freeman Mill Road to East Main Street. No improvements are necessary.
- * **Rice Street** from Charlotte Street to Oak Avenue. No improvements are necessary.

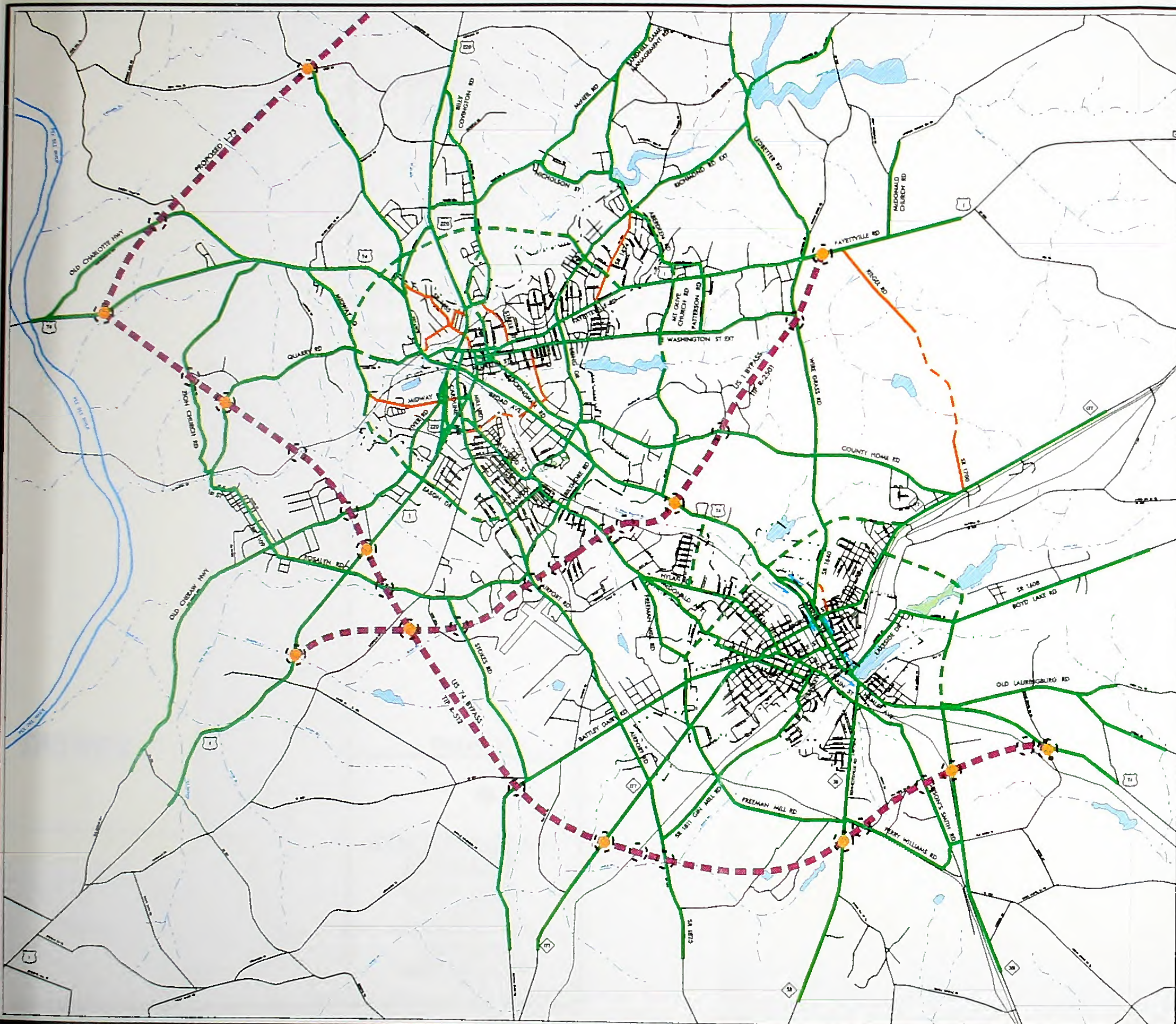
Hamlet Minor Thoroughfares:

- * **Riegel Road to E.V. Hogan Road Connector.** This two-lane facility would provide a direct connection and travel access between US 1 and NC 177. The demand for this facility is not immediate. However, if the travel demand on Wire Grass Road increases, this connector should provide the necessary relief.
- * **Washington Avenue Extension** to Wire Grass Road. This two-lane facility is currently under construction, and is scheduled for completion in the Fall of 1996. This facility should provide the needed relief of travel to the Green Street elementary school.

INTERSECTION GEOMETRICS:

Three additional projects have been recommended to decrease accidents at intersections and to increase travel safety. These suggestions are based on total number of accidents (reported between 5/93 - 5/96), geometrical design, local planning input, and field investigations. It should be noted that each of the following projects require additional investigation. A contact representative is listed for each project.

- * **Hamlet One Way Pair.** A solution to the severe congestion problems created by the two signalized intersections on Raleigh Street is to convert Spring Street and Hamlet Avenue into a one way pair. The proposed one way pair as seen on the Construction Plan would separate the eastbound and westbound traffic. Two travel lanes would be provided for each direction, and would not require additional right-of-way. Nor, would this proposal require the on-street parking for the businesses along Hamlet Avenue between Raleigh Street and Front Street. For a complete discussion of purpose and need, see Chapter V.
- * **Wire Grass Road (SR 1640)** is currently offset as it ties into Spring Street (SR 1639). An investigation should be conducted by the Traffic Engineering Branch to determine if Wire Grass Road can be realigned to flow into Williams Street. This facility provides service to US 74 and Hamlet CBD.
- * The Traffic Engineering Branch, NCDOT with the assistance of the local planning staff should investigate the intersection of **Freeman Mill Road** and Battley Dairy Road. Presently, Freeman Mill Road is offset as it ties into Battley Dairy Road.



LEGEND

	EXISTING	PROPOSED
FREEWAY/ EXPRESSWAY		
MAJOR		
MINOR		
INTERCHANGE		
GRADE SEPARATION		
PROPOSED ONE-WAY PAIR		

ADOPTED BY:

CITY OF ROCKINGHAM	MAY 14, 1996
CITY OF HAMLET	APRIL 16, 1996
RECOMMENDED APPROVAL BY STATEWIDE PLANNING BRANCH	OCTOBER 30, 1996
N.C. DEPARTMENT OF TRANSPORTATION	DECEMBER 6, 1996
PUBLIC HEARINGS	APRIL 16 / MAY 14, 1996



APRIL 3, 1996

FIGURE 2

RECOMMENDED THOROUGHFARE PLAN FOR ROCKINGHAM HAMLET

RICHMOND COUNTY
NORTH CAROLINA
Prepared by the
North Carolina Department of Transportation
Division of Highways-Statelike Planning Branch
in cooperation with
U.S. Department of Transportation
Federal Highway Administration

0 2000 4000 6000 8000 FEET

BASE: 1993

CONSTRUCTION PLAN

MARCH 26, 1996

LEGEND



- TIP PROJECTS 
- PROPOSED MULTI-LANE FACILITY 
- PROPOSED TWO-LANE FACILITY 
- PROPOSED INTERCHANGE 
- PROPOSED ONE-WAY PAIR 

FIGURE 3

ROCKINGHAM HAMLET

RICHMOND COUNTY
NORTH CAROLINA

Prepared by the
North Carolina Department of Transportation
Division of Highway-Street Planning Branch
in cooperation with
U.S. Department of Transportation
Federal Highway Administration



BASE: 1993



III. IMPLEMENTATION

DETAILING OF THE PLAN:

For the proper administration of subdivision regulations and to obtain more accurate cost estimates of proposed facilities, it would be desirable that the plan be detailed to the extent that preliminary designs of proposed facilities are delineated on topographic mapping of a horizontal scale of 1" = 100' or 1" = 200'. Such preliminary design would more fully indicate the nature of proposed improvements, right-of-way needs, and the effect of proposed improvements on adjacent properties. This detailing of the plan could be accomplished by the City, or by a consultant employed by the City. On key major thoroughfares, the City may also request that NCDOT assist in providing a functional design. It is important to note that if federal funds are to be used to construct the project, the NEPA process must still be followed. The design, will therefore, be one of the alternatives considered in the NEPA document. The environmental screening and level of detail provided in a functional design typically results in selection of a design which is consistent with the approved corridor in the NEPA document.

CONSTRUCTION PRIORITIES:

Construction priorities depend on the potential that proposed projects have to satisfy various objectives. Some of the most important objectives are (1) improvement of the State's arterial system; (2) cost effective improvement of the safety and level-of-service of all roads and highways on the State system; (3) encouragement of economic development; (4) preservation of the environment; and (5) fair and equitable allocation of project funding.

ENVIRONMENTAL CONCERNS:

Environmental factors considered in highway project evaluation can be divided into three categories -- physical, social/cultural, and economic. Factors from these categories are utilized in the benefits analysis. These primary environmental factors are discussed in more detail in Chapter VII. The relative environmental impact of a project is subjectively measured by summing the positive and negative impacts on various environmental factors.

The economic impact of a project is an estimate of the probability that the project will stimulate economic growth in the planning area. This probability is subjectively calculated based on knowledge of the project, local development characteristics, and land development potential. The probability of economic development is then rated on a scale of 0.00 (none) to 1.00 (excellent). **Table 1** contains the calculated environmental and economic impacts for each of the major projects.

BENEFIT ANALYSIS:

Benefits are determined based on cost savings to the network users. The total benefit is the sum of the savings in three categories. These categories are vehicle operating costs, travel time costs, and the cost of accidents. The reduction in each of these costs is the "project" benefits received by the users. The benefits produced by each project is then compared to the estimated cost of building the project. A benefit/cost analysis was performed on the major projects in the Rockingham/Hamlet Thoroughfare Plan. These projects and their benefits are shown in **Table 1.**

TABLE 1

CONSTRUCTION PRIORITIES AND COST ESTIMATES

HIGHWAY SECTION	RECOMMENDED CROSS SECTION	LENGTH MI/(KM)	COST ESTIMATES (\$1,000)	ENVIRON. IMPACT (\$1,000)	ECONOMIC DEVELOPMENT POTENTIAL
				PROBABILITY	
PROGRAMMED PROJECTS:					
R-512: US 74 BYPASS					
1. NEW LOCATION	A	13.1 (21.1)	112,420	---	112,420 N/A
R-2501: US 74 BYPASS					
2. NEW LOCATION	A	22.4 (36.0)	68,300	10,300	78,600 N/A
R-3421: I-73/74 CORRIDOR					
3. NEW LOCATION	A	10.5 (16.9)	83,600	17,200	100,800 N/A
FIRST PRIORITY:					
LONG DRIVE:					
WASHINGTON TO US 74					
1. WIDENING PROJECT	N	1.84 (3.0)	2,540	N/A	153,059
					+.60
					-.10
ROCKINGHAM ROAD:					
LEAK ST. TO LONG DR					
2. WIDENING PROJECT	N	1.64 (2.6)	2,952	N/A	60,701
					+.60
					-.10
HYLAN-US74 CONNECTOR					
3. NEW LOCATION	O	.81 (1.3)	1,716	58	1,774
					50,947
					+.40
					-.30
MOUNT OLIVE CHURCH ROAD EXTENSION					
4. NEW LOCATION	O	.76 (1.2)	1,348	150	1,498
					79,144
					+.40
					-.40
MOUNT OLIVE-ABERDEEN ROAD CONNECTOR					
5. NEW LOCATION	O	.19 (0.3)	265	20	285
					3,370
					+.40
					-.20
NC 177 BYPASS					
6. PARTIAL NEW LOCATION	O	3.46 (5.6)	5,420	302	5,722
					21,613
					+.50
					-.50

NPB - NORTH PLANNING BOUNDARY	EPB - EAST PLANNING BOUNDARY	ECL - EAST CITY LIMIT
SPB - SOUTH PLANNING BOUNDARY	WPB - WEST PLANNING BOUNDARY	WBL - WEST BOUND LANE

IV. TRAVEL DEFICIENCY ANALYSIS OF THE EXISTING SYSTEM

GENERAL:

This chapter presents an analysis of the ability of the existing street system to serve the area's travel desires. Emphasis is placed not only on detecting the deficiencies, but on understanding their cause. Travel deficiencies may be localized and the result of substandard highway design, inadequate pavement width, or intersection controls. Alternately, the underlying problem may be caused by a system deficiency such as a need for construction of missing links.

EXISTING TRAVEL PATTERNS:

An indication of the adequacy of the existing street system is a comparison of traffic volumes versus the ability of the streets to move traffic. In an urban area, a street's ability to move traffic is generally controlled by the spacing of major intersections, access control, width of pavement, and the traffic control devices (such as signals) utilized.

For the definition of **capacity** and **level of service (LOS)** as it relates to traffic operation, please refer to Chapter 2 of the supplemental report, "Generalized Chapters for Thoroughfare Plan Reports".

EXISTING MAJOR STREET SYSTEM:

The Cities of Rockingham and Hamlet are similar to many urban areas with a grid system at the center of the City and radials accessing the planning area (for additional discussion, refer to Chapter 1, of the supplemental report). US 74 is a primary facility passing through the planning area. Its function serves two purposes. US 74 carries commercial traffic as well as intrastate travel generated by the following radials; US 1 (carrying southbound traffic from Southern Pines and northbound traffic from South Carolina); US 220 (carrying southbound traffic from Asheboro to US 74 at Rockingham); NC 177 (serves primarily Hamlet by collecting traffic from US 1 from the north and Wallace, and South Carolina from the south). Two other facilities, NC 38 and NC 381 feed off of US 74 at Hamlet and carry traffic to-and-from South Carolina.

The attraction between the two Cities of Rockingham and Hamlet creates a very unique traffic condition. This "bipolar" attraction is formed by local trips being generated for work, shopping, and recreational purposes. Although most of this traffic is facilitated by US 74, Airport Road, Beaunit Avenue, Hylan Drive, and Country Home Road provide additional local service.

PARKING INVENTORY:

Parking is a consideration in any thoroughfare planning study because it directly affects the capacity of individual facilities. On-street parking limits the capacity of a roadway, while a deficiency of parking adds to the congestion of an area by increasing circulation. Since on-street parking reduces the capacity of thoroughfares, parking removal is one of the first procedures applied in attempting to increase the capacity of a facility. Generally, on-street parking is not a problem in the Planning Area.

EFFECTS OF 1994 TRAFFIC ON THE EXISTING SYSTEM:

High Accident Location - Traffic accident records are of assistance in defining problem areas and often pinpoint a deficiency such as poor design, inadequate signing, ineffective parking, or poor sight distance. Accident patterns developed from analysis of accident data can lead to remedial action reducing the number of accidents.

Both the severity and number of accidents should be considered when investigating accident data. The severity of every accident is measured with a series of weighting factors developed by the Division of Highways of the NCDOT. In terms of these factors, a fatal or incapacitating accident is 47.7 times more severe than one involving only property damage, and an accident resulting in minor injury is 11.8 times more severe than one with only property damage.

TABLE 2
HIGH ACCIDENT SUMMARY 5/93-5/96

LOCATION	TOTAL	SEVERITY
1. BROAD ST./CAROLINE ST.	50	7.29
2. BILTMORE DR./BROAD ST.	38	3.34
3. BROAD ST./LONG DRIVE	37	6.45
4. US 220/BROAD AVE.	36	7.06
5. BROAD ST./ROCKINGHAM ROAD	32	5.68
6. NC 177/SPRING ST.	31	4.58
7. US 220/GREEN ST.	29	6.17
8. NC 38/MAIN ST.	22	9.49
9. US 1/MIZPAH ROAD	22	8.48
10. BROAD ST./DOGWOOD	20	12.28
11. BROAD ST./HANCOCK	19	4.12
12. LONG DR./ROCKINGHAM ROAD	17	5.79
13. BROAD ST./GREEN	16	23.19
14. US 74/NC 177	16	9.90
15. LONG DR./WASHINGTON	16	8.05
16. RALEIGH ST/SPRING ST.	14	4.70
17. BROAD ST./LEE ST.	14	4.17
18. BROAD ST./PICKETT	14	3.64
19. BROAD ST./LAWRENCE	14	3.11
20. NC 177/CHARLOTTE ST.	13	6.12

TABLE 2 (cont'd)
HIGH ACCIDENT SUMMARY 5/93-5/96

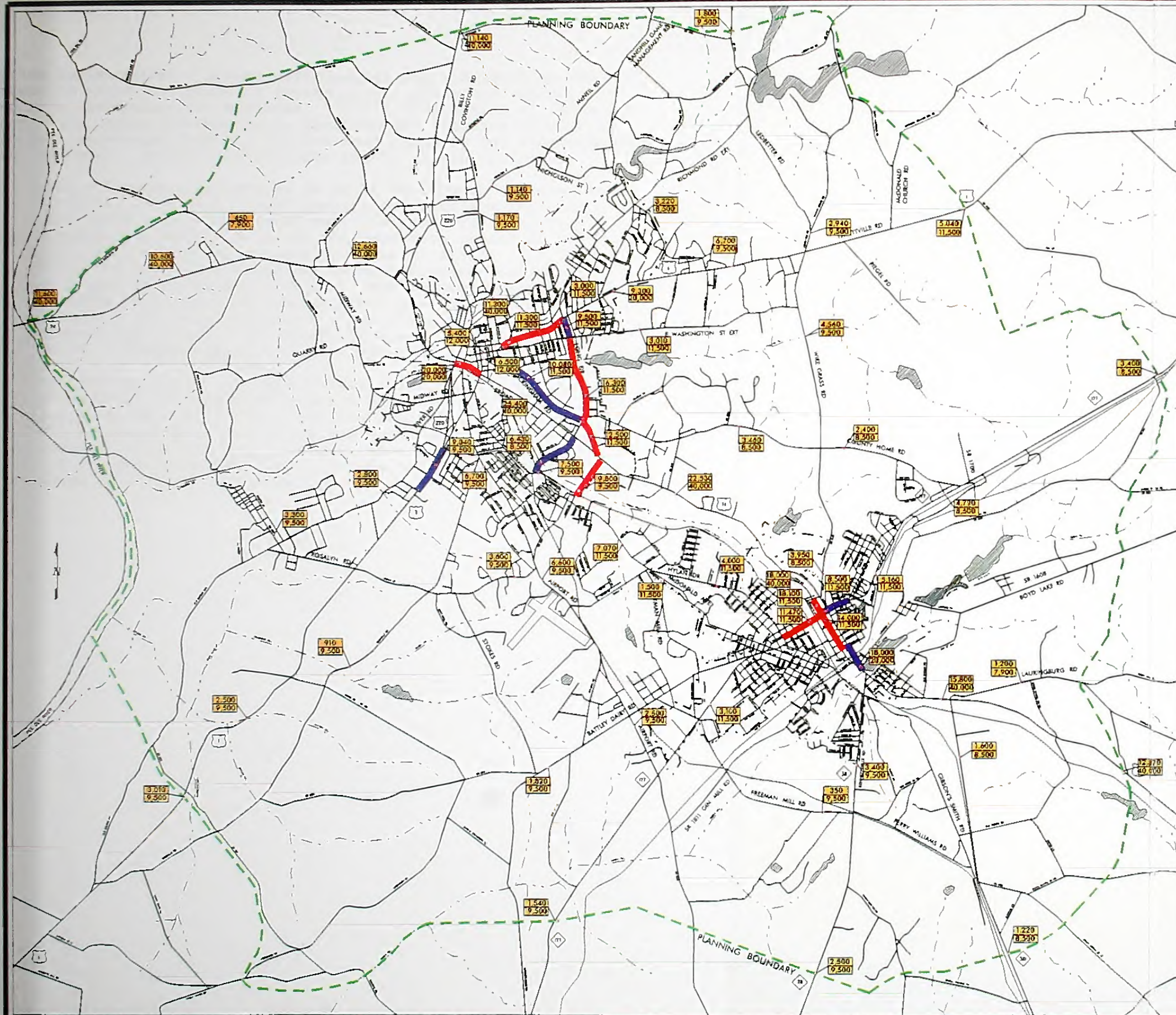
LOCATION	TOTAL	SEVERITY
21. US 74/WILLIAM ST.	13	3.85
22. HAMLET/WILLIAM ST.	12	11.02
23. NC 177/HAMLET AVE.	12	4.70
24. HAMLET AVE/RALEIGH	12	2.23
25. COUNTRY HOME/LONG DRIVE	12	1.62
26. MIZPAH/AIRPORT ROAD	11	17.47
27. CAROLINE/HANCOCK	11	11.93
28. LONG DR/MILL ROAD	11	6.38
29. COUNTRY HOME/WIRE GRASS ROAD	10	20.60
30. US 1/EASON DR.	10	6.92
31. BROAD ST./LADY MARY	10	5.44
32. BROAD ST./THOMAS PARK	10	3.96
33. US 74/THIRD ST.	10	3.22

The "Total" column indicates the total number of accidents reported within two hundred (200) feet of the intersection during the indicated time period. The severity listed is the average accident severity for that location.

Capacity Deficiencies - **Figure 4** depicts the base year (1994) major street system, and the **ADT** (Average Daily Traffic). A comparison of the base year ADT to capacities reveals several streets near or over practical capacity (LOS D). These areas are highlighted, and include:

- o US 74 (Broad Avenue and Hamlet Avenue)
- o US 1 (Fayetteville Road)
- o NC 177 (Marlboro Street and Freeman Street)
- o Long Drive
- o Rockingham Road
- o Biltmore Drive

There are several locations within the planning area which have high volumes. Traffic volumes in excess of 25,000 vehicles per day (in 1994) occurred on US 74 within the Rockingham City Limits and 18,000 in Hamlet, while counts as high as 16,000 vpd have occurred on Long Drive near the Richmond Memorial Hospital.



EXISTING TRAFFIC (1994) ON
THE EXISTING NETWORK

NEAR LOS D
EXCEEDING LOS D

1994 ADT
TOTAL CAPACITY

MAY 23, 1995

FIGURE 4

ROCKINGHAM HAMLET

RICHMOND COUNTY
NORTH CAROLINA

Prepared by the
North Carolina Department of Transportation
Division of Highway-Statistical Planning Branch
in cooperation with
U.S. Department of Transportation
Federal Highway Administration



BASE: 1993

System Deficiencies - System deficiencies are a measure of the extent to which the existing system lacks continuous radials, loops, cross-towns, and bypasses. (for a description of radials, loops, etc. refer to Chapter 1, Thoroughfare Planning Principles of the supplemental report, "Generalized Chapters for Thoroughfare Plan Reports". System deficiencies in the system include:

- Lack of controlled access on US 74 throughout the planning area has created a number operational problems including; spillback delays at signalized intersections, hazardous weaving movements, and high accident rate caused by turning movements accessing adjacent commercial areas. The 1995-2001 TIP (Transportation Improvement Program) includes the proposed US 74 Bypass (R-512). This project would carry through trip and local traffic on a controlled access facility and would alleviate a large percentage of traffic travelling through Rockingham and Hamlet on the existing US 74 (including Summer beach traffic).
- No loop system or circumferential streets exist. Loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve central areas. Much of the problems with Long Drive and Rockingham Road could be relieved with the implementation of a loop system facility. TIP Project #: R-2501 would provide the necessary relief to these facilities depending on its final location.

214
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loop
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214

V. ANALYSIS OF NEEDS

GENERAL:

This chapter presents an analysis of the ability of the existing street system to serve the area's travel desires as the area continues to grow. The usefulness of transportation planning is in the analysis of different highway configurations for their efficiency in serving the area. The following includes several alternatives for providing specific services to the area.

GOALS AND OBJECTIVES:

The Cities of Rockingham and Hamlet have their own priorities and concerns relating to the transportation system, and related topics. In order to determine the items of importance to the planning area, a "Goals and Objectives" survey was conducted in 1995. The survey included questions about topics such as new roads, improvements to existing roads, sidewalks, landscaping, and intersections. Additional space was provided for comments at the end of the survey. See Appendix B for a complete discussion of the Goals and Objectives Survey.

The results of the survey indicated that the transportation improvements most desired were preservation of neighborhood/community, increased traffic safety, and avoiding urbanization and strip development. Other goals viewed as important include improving travel safety for pedestrians/bicyclists and encouraging economic vitality.

With regard to local project needs, there exists an overwhelming support for the US 74 Bypass. On the other hand, very little support was recorded for widening US 220 to a multilane facility.

ALTERNATIVE PLANS:

The process of developing, testing and evaluating alternate plans involved a number of considerations. These included area goals and objectives (above), identified deficiencies (**Chapter IV**), environmental impacts, existing and anticipated land development, and travel service. Travel forecasts provide a basis for evaluation of alternatives as to ability to serve future travel needs. Aerial photography, topographic mapping, field reconnaissance and discussion with city staff, planning officials and interested local citizens provided additional basis for identifying and evaluating the alternative alignments.

Some of the major system problems which need to be addressed by the thoroughfare plan include: deficiency for serving the US 74 Bypass (Broad Avenue) corridor traffic; and determining what to do at the two signalized intersections along Raleigh Street, between Spring Street and Hamlet Avenue.

Do Nothing Alternative:

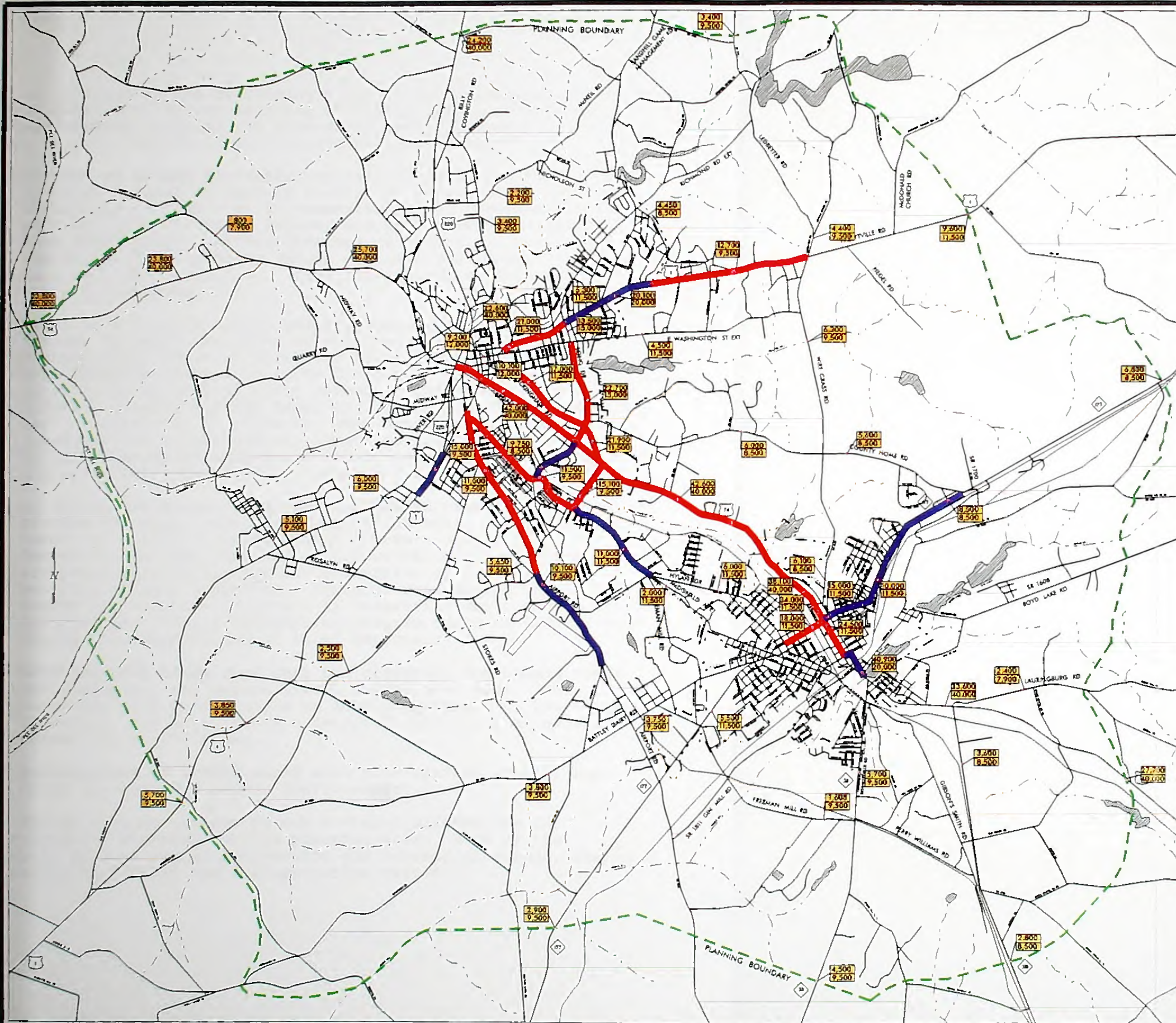
An alternative to any proposed improvement is a "do nothing" option. There can be varying degrees of a "do nothing" policy, meaning no highway improvements to the existing network, to a partial "do nothing" policy, meaning no new highways (only minor improvements to the existing system). **Figure 5** highlights the areas where facilities are at or near the practical capacity for the design year of 2020. Some of the major advantages of doing nothing are:

- (1) No capital investment.
- (2) No removal of landscaping.
- (3) No additional land acquisition.
- (4) No displacement of people or business as a result of construction.

However, there are a number of disadvantages to a "do nothing" policy which would have significant adverse effects on the urban environment. These include:

- (1) Increased traffic congestion on major facilities resulting in increased air pollution and driver frustration.
- (2) Social, health, and safety standards would deteriorate.
- (3) Increased driving time and road user costs.
- (4) Increased accidents.
- (5) Reduced mobility for emergency vehicles.
- (6) Loss of potential gains in commerce trade due to congestion.

The most dramatic consequence of this option is the poor operations of the Broad Avenue/Hamlet Avenue corridor. It is estimated that the amount of traffic on this facility will double by the design year. However, the proposed US 74 Bypass (TIP project R-512 will relieve most of the through trip traffic from the corridor. However, by the design year of 2020, local traffic along Broad Avenue is expected to increase to the current level of congestion even with the implementation of the US 74 Bypass and US 1 Bypass. The increase in congestion level can be attributed to the existing and anticipated commercial development along existing US 74. Without access control measures and limiting the number of curb cuts for commercial development along this corridor, travellers will experience stop-and-go progression and poor Levels-of-Service on a significant portion of Broad Avenue/Hamlet Avenue within the planning area. Couple this with the inevitable incident along the facility and grid-lock may occur. Whether it is a stalled vehicle or an accident, incidents are the number one cause for highway congestion.



FUTURE TRAFFIC (2020) ON THE EXISTING NETWORK

- NEAR LOS D
- EXCEEDING LOS D

2020 ADT
TOTAL CAPACITY

JUNE 6, 1995

FIGURE 5

ROCKINGHAM HAMLET

RICHMOND COUNTY
NORTH CAROLINA

Prepared by the
North Carolina Department of Transportation
Division of Highways-Statistical Planning Branch
in cooperation with
U.S. Department of Transportation
Federal Highway Administration



BASE: 1991

In addition to the do nothing plan, it is desirable to take a more in depth look at the existing street system to determine if **non-construction** projects can enable the existing system to serve future travel. Non-construction alternatives include:

- o **Control of access** increases capacity where it has been eroded by large volumes of turning traffic at many closely spaced locations, such as a strip commercial zone. Several sections of Broad Avenue, Hamlet Avenue, and US 1 provide examples of such development. As new development occurs, it would be beneficial to attempt to reduce or limit the number of curb cuts to these facilities. This alternative is applicable to the planning area.
- o Prior to a traffic signal being installed on a facility, the through movement is permitted continuously. Upon signal installation, the time permitted for the through movement is significantly reduced to allow for conflicting movements, possibly by as much as fifty percent. This results in a reduced capacity for the facility. It is therefore important that signals only be installed when needed, and with consideration to the overall impact on the facility. Signal locations on Broad Avenue and Hamlet Avenue should be highly regulated and coordinated to provide for signal progression.
- o An aggressive **carpool, vanpool, or public transit** program would process the same number of person-trips while decreasing the number of vehicle-trips and thus decrease congestion. Currently, neither City has an historical pool of vehicle occupancy data to analyze for evaluation of the possible benefits of such a program. However, considering the current amount and anticipated growth in industrial development within the planning area, a ridesharing program could be incorporated through the cooperation of local employers.
- o **Altering work hours** such that the beginning and ending times are staggered, can reduce travel in the peak hour. The resulting peak period would be less congested, but last longer. Therefore, the total traffic carrying ability of an existing street can be increased.
- o **Restrictions on growth** would also slow traffic growth, and delay the need for street improvements.

The do nothing concept is not a viable alternative in transportation planning for the planning area. Some of the concepts, such as signal progression and control of access, should be used to compliment the transportation system.

The following section is a detailed discussion of the old thoroughfare plan (mutually adopted in 1979) and the changes implemented as a result of this study. This section attempts to identify the purpose and need for each proposal.

OLD THOROUGHFARE PLAN

The previous Thoroughfare Plan for Rockingham/Hamlet was adopted in 1979. Major street improvements include:

Facility:	Description of Improvement:
* US 74 Bypass	4-lane divided facility on new location
* US 1	Widen roadway to a multi-lane facility with a bypass of Rockingham on new location
NC 177 Bypass	From SR 1628, Dobbins Heights to south of Freeman Mill Road on new location
NC 177	Widen existing facility to multi-lane, north of proposed Bypass
Long Drive Connector	Proposed multi-lane facility
NC 381 Extension	Proposed 4-lane divided facility from NC 381 to NC 177
Park Avenue Loop	2-lane extension of Park Avenue from US 74 to the proposed US 1 Bypass
Mill Road-Haywood St.- Beaunit Street Widening	4-lane undivided widening
* Transportation Improvement Programed projects.	

Changes to the Old Thoroughfare Plan
(adopted 1979)

Deletions - Rockingham:

- **Hannah Picket Extension** to Long Drive. This area has experienced high residential growth. The project is eliminated because it would require 40-50 dwelling units/apartments.
- **Midway Extension** to existing US 74. A pond and the Fruit of the Loom Complex has forced this connection to be shifted to the west. This shift may create design problems as the alignment ties into US 74 at a sloped and curved location.

Additions - Rockingham:

- **US 1 Bypass** (R-2501) is now planned as a full control access facility. Therefore, the alignment has changed. The project is currently undergoing the first phase of the environmental assessment. There are 3 primary corridor alternatives being considered. (Ref: Byron Brady, P&E Project Engineer) At this time, there is no proposed interchange between existing US 1 and existing US 74.

The Construction Plan: Shows the US 1 Bypass closer in proximity to Rockingham. This preferred corridor minimizes the impacts to existing wetlands. The other US 1 corridors extend further eastward requiring substantial wetland acreage and an increase in construction cost.

- **Mount Olive Church Road Extension** to Baldwin Road. The purpose of this facility is to provide travellers in North Rockingham and US 1 additional access to the hospital and mall/shopping area.

disadvantages:

- * would require water intake to be shifted eastward or closure

advantages:

- * Rockingham Road and Long Drive, currently over-capacity, would have substantial traffic relief.
- * This proposed facility may acquire 1 house, however, the need for this facility is created by travellers in North Rockingham to the US 1 Bypass (ie. mall/ shopping/ restaurants/ hospital). The model has shown high demand for such a facility. As a note, north Rockingham area, near Roberdel and Nicholson Street is anticipated to be the highest growth potential for the planning area.

note:

- * local area must consider impacts to water quality if development is allowed to occur around present water intake location

- **Park Avenue Extension** to US 1. The development in this area including the new Food Lion will require this connector to be shifted north, adjacent to Lawson Lane. This shift in the alignment would allow the tie-in to be made with the facility adjacent to the Food Lion.

Deletions - Hamlet:

- **High Street to Spring Street Connector** is not feasible. This proposal would be too destructive if built. It would necessitate the relocation of 6-7 houses. One of which is an eligible National Historic Property. Design year ADT is expected to reach approximately 20,000 vpd, even with implementation of the US 74 Bypass. Truck percentages are expected to decrease only slightly due to the number of service trucks to Hamlet CBD and the Rockingham mall and commercial area on the existing US 74.

Currently, US 74 is designated south along Hamlet Avenue to Raleigh Street, and south on Spring Street. The Average Daily traffic through this corridor is approximately 18,000 vpd. The two traffic signals on Raleigh Street creates spill back problems during peak and *non-peak hour* travel periods. These two intersections are designated as high accident locations (17 accidents in 3 years)

- **Thomas Street Extension** to Lake Drive. Residential growth in this area will not allow for this connection to be made. Six unit apartment complex and several duplexes would be required.
- **Walnut Avenue Extension** to Gin Mill Road. This connection can not be made. Walnut Street dead ends into a utility structure and three houses have been built in its path. In addition, the tie-in to Gin Mill Road is limited by extensive wetlands, a flood plain, and a pond in three of the four quadrants.
- **Boyd Lake connector to US 74.** The traffic bypassing Hamlet to the north accessing NC 117 or continuing west to US 74 would be served adequately by the proposed connector between 5th Street extension and NC 381.

Additions - Hamlet:

- **Hamlet One Way Pair.** A solution to the severe congestion problems created by the two signalized intersections on Raleigh Street is to convert Spring Street and Hamlet Avenue into a one way pair. The proposed one way pair as seen on the Construction Plan would separate the eastbound and westbound traffic. Two travel lanes would be provided for each direction, and would not require additional right-of-way. Nor, would this proposal require the on-street parking for the businesses along Hamlet Avenue between Raleigh Street and Front Street.

A true benefit to such a proposal is that employing a one way pair would not require the construction of a new facility. Spring Street and Hamlet Avenue, with the present alignment will provide the capacity and safety improvements necessary to make this change.

A grade separation for the Seaboard Coastline Railroad tracks and Hamlet Avenue would be required. The tracks could be elevated similar to Spring Street.

Obviously, with any new proposal there are potential impacts that must be considered. This is why it is so important to weigh the different issues at hand to ultimately determine what is best for the community. In this case, Spring Street residents will be subjected to additional traffic including service vehicles. If a one way pair was implemented today, one would expect approximately 8,000 vehicles to travel on Spring Street at the current traffic level.* However, the current width of Spring Street (2-lanes) would allow approximately 12,000 to 14,000 vehicles per day (vpd) at an acceptable level of service.**

* 1995 traffic counts on Spring Street are 5,100 vpd.

** Source: Bureau of Multi-Modal System Planning, Florida Department of Transportation.

The **purpose and need** for this project is twofold:

- 1) The current designation and operation of US 74 is an extreme safety hazard. Because of the proximity of the two signals on Raleigh Street, operational problems become hazardous when peak hour traffic is forced between two signals and the conflicting turning movements in a one block distance. In the past five years, the two intersections of Raleigh St/Hamlet Avenue and Raleigh St/Spring Street have contributed to a total of 35 reported accidents. Implementing a one way operation would separate the dangerous turning movements while providing the needed capacity.
- 2) The capacity of US 74 along this corridor ranges from 10,000 to 15,000 vpd. Couple this with the back to back signals on Raleigh Street and it creates a higher potential for accidents. At the current level of traffic (18,000 vpd) sections of US 74 along this corridor operate at a level of service "D" and sometimes "E". This means that drivers are experiencing stop and go traffic throughout the day.

The Environmental Impact Statement R-512 for the US 74 Bypass is a detailed alternatives analysis which includes projections for future traffic. Published in 1992, this document includes projections for traffic on existing US 74 with the implementation of the Bypass. According to the report, the projected 2016 traffic on existing US 74 through Hamlet will reach approximately 29,000 vpd. On the other hand, the new US 74 Bypass is estimated to carry only 13,000 vpd by the same design year.

- **Hylan Road Connector to US 74.** This 2-lane proposed connector would allow Hamlet residents living south of the Seaboard Coast Line Railroad direct access to existing US 74. Presently, this traffic is forced to use Biltmore Road when traveling to the mall area. Marlboro Street is the other closest access point to US 74. Both facilities are currently over capacity. The proposal will also provide immediate access to the proposed interchange for the US 1 Bypass.

The location of this facility was chosen because it provides proper spacing for a connector facility while requiring the least amount of new construction.

- **Riegel Road to E.V. Hogan Road Connector.** This two-lane facility would provide a direct connection and travel access between US 1 and NC 177. The demand for this facility is not immediate. However, if the travel demand on Wire Grass Road increases, this connector should provide the necessary relief.

- **Washington Avenue Extension** to Wire Grass Road. This two-lane facility is currently under construction, and is scheduled for completion in mid 1996. This facility should provide the needed relief of travel to the Green Street elementary school.

VI. LAND USE AND POPULATION

The flow of traffic within an area is based on the physical conditions of the travelways, population, land use, and the economic conditions within that area. Before an accurate estimate of traffic can be made for future travel patterns an accurate investigation of present land use, population, economy, and road usage must be completed. An estimate can be made of travel for the future year based on existing travel trends. Usually the planning horizon is twenty years from the base year. The planning horizon for this study is twenty-six years. A more detailed explanation of this modeling process can be found in Chapter VIII.

POPULATION TRENDS:

The amount of travel on a road network is based partly on the population within the planning area. **Table 3** shows historic population totals over the past twenty-four years. The population within the City's of Hamlet and Rockingham have increased by over 45 percent from 1970 to 1990 (N.C. State Data Center). On the other hand, the population of Richmond County has increased by only twelve percent within the same period.

TABLE 3
POPULATION TRENDS

<u>POPULATION:</u>	1970	1980	1990	1994	2010	2020
Rockingham/Hamlet/ Dobbins heights City Limits	* 11,476	* 14,257	* 16,739			
Rockingham/Hamlet Planning Area				33,500	*** 36,410	*** 38,350
Richmond County	* 39,889	* 45,161	* 44,518		** 43,396	
North Carolina	*5,084,411	*5,880,095	*6,628,637		**8,070,877	
Dwelling Units				13,962		**17,432
Persons/D.U.				2.40		2.20

* U.S. Census Data

** N.C. State Data Center

*** Rockingham/Hamlet Planning Staff/NCDOT

LAND USE:

The generation of traffic on a particular street is closely related to the land use of the adjacent property on that street. Some types of land uses generate more trips than others. Some land uses attract more trips than others. For example, a shopping center generates larger traffic volumes than residential areas. It is important in transportation planning to differentiate between land use types so their present and future distribution throughout the planning area can be used to determine existing and future traffic patterns.

There are several variables used to forecast future land development. Some of them are: anticipated population changes; historical trends in different development types; the availability and effectiveness of legal controls, regulations, and ordinances; the availability of utility and transportation facilities; and major topographic or other environmental features. **Figures 6 & 7** show the existing and anticipated employment and population growth trends for the planning area. (estimates supplied by Rockingham and Hamlet Planning Departments)

ECONOMIC TRENDS:

Rockingham and Hamlet are centrally located near three large cities. Charlotte is seventy-six miles west. Fayetteville is sixty-four miles east. Raleigh is one hundred miles north. The availability of employment and employee purchasing power determine how large an economic base an area can support. In 1990, there was a 5.9% unemployment rate with 22,361 people employed in Richmond County. The purchasing power of a family is related to the income of that family. In 1990, the average family income in Richmond County was \$26,747, in the U.S. \$34,000, and in N.C. \$31,548.

In May through August of 1994, socio-economic data for the planning area was collected by the Rockingham Planning Department and NCDOT. For each business, the number of employees were recorded and checked for accuracy. Employment projections for the design year of 2010 and 2020 were completed by the Rockingham and Hamlet Planning Departments. Tabulated below, are the results of this study.

<u>EMPLOYMENT:</u>	1970	1980	1990	1994	2010	2020
Rockingham/Hamlet Planning Area:		7,000		15,568	*16,930	*17,821
Richmond County	15,960	16,930	21,014			

* Rockingham/Hamlet Planning Staff

EXISTING LAND USE

EXISTING DWELLING UNITS (1994)

RESIDENTIAL:

- LOW DENSITY (0-49 D U'S)
- MEDIUM DENSITY (50-149 D U'S)
- MEDIUM-HIGH DENSITY (150-299 D U'S)
- HIGH DENSITY (300+ D U'S)

FIGURE 6A

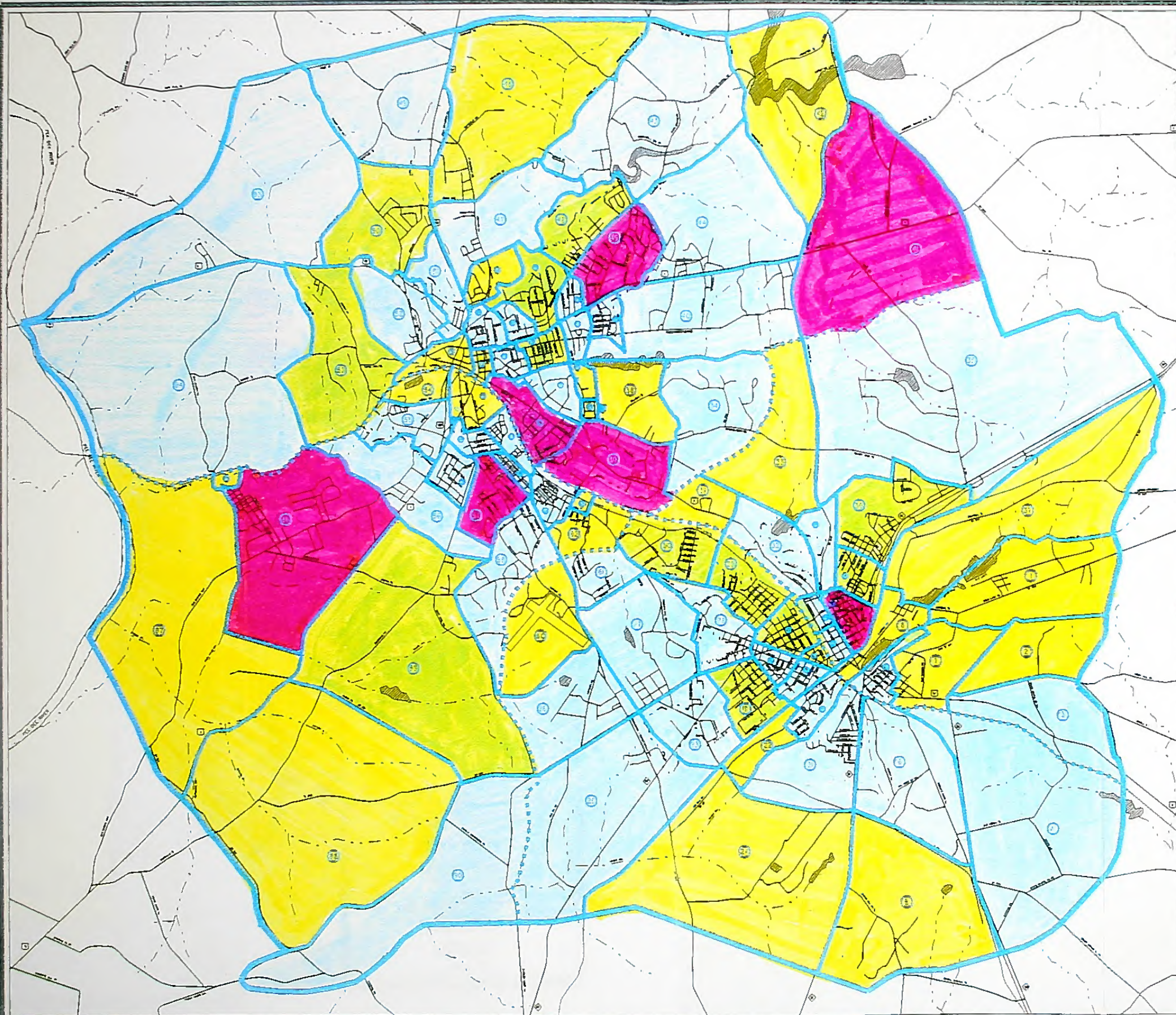
ROCKINGHAM HAMLET

RICHMOND COUNTY
NORTH CAROLINA

Prepared by the
North Carolina Department of Transportation
Division of Highway-Related Planning Branch
in cooperation with
U.S. Department of Transportation
Federal Highway Administration



BASE: 1993



EXISTING LAND USE

EXISTING EMPLOYMENT

(1994)

EMPLOYMENT:

- LOW DENSITY (0-49 EMPLOYEES)
- MEDIUM DENSITY (50-149 EMPLOYEES)
- MEDIUM-HIGH DENSITY (150-299 EMPLOYEES)
- HIGH DENSITY (300+ EMPLOYEES)

FIGURE 6B

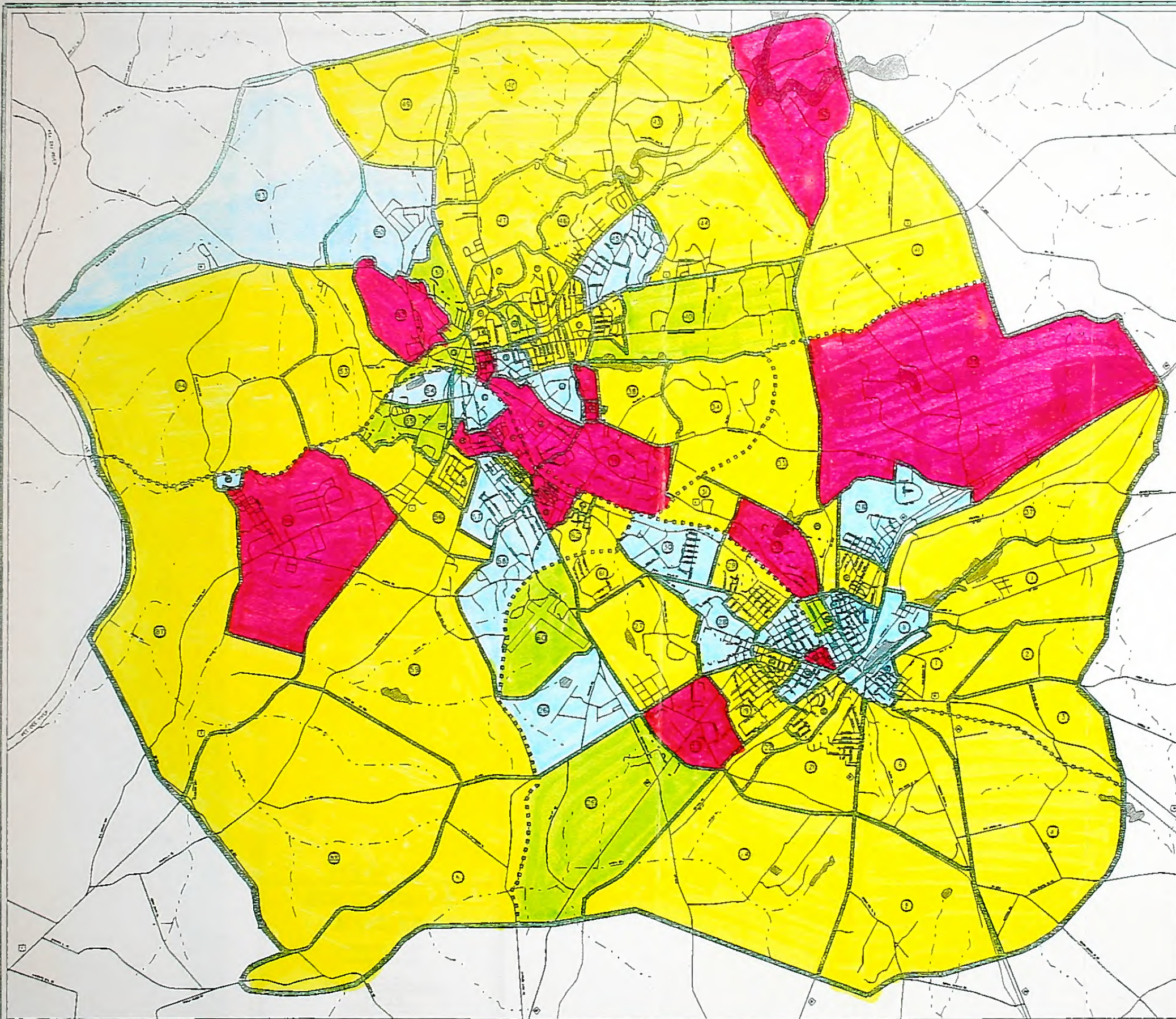
ROCKINGHAM HAMLET

RICHMOND COUNTY
NORTH CAROLINA

Prepared by the
North Carolina Department of Transportation
Division of Highway-Related Planning Studies
in cooperation with
U.S. Department of Transportation
Federal Highway Administration



BASE: 1993



FUTURE GROWTH TRENDS

DWELLING UNIT PROJECTIONS (2020)

RESIDENTIAL:

LOW DENSITY
(0-49 D U'S)

MEDIUM DENSITY
(50-149 D U'S)

MEDIUM-HIGH DENSITY
(150-299 D U'S)

HIGH DENSITY
(300 /+ D U'S)

FIGURE 7A

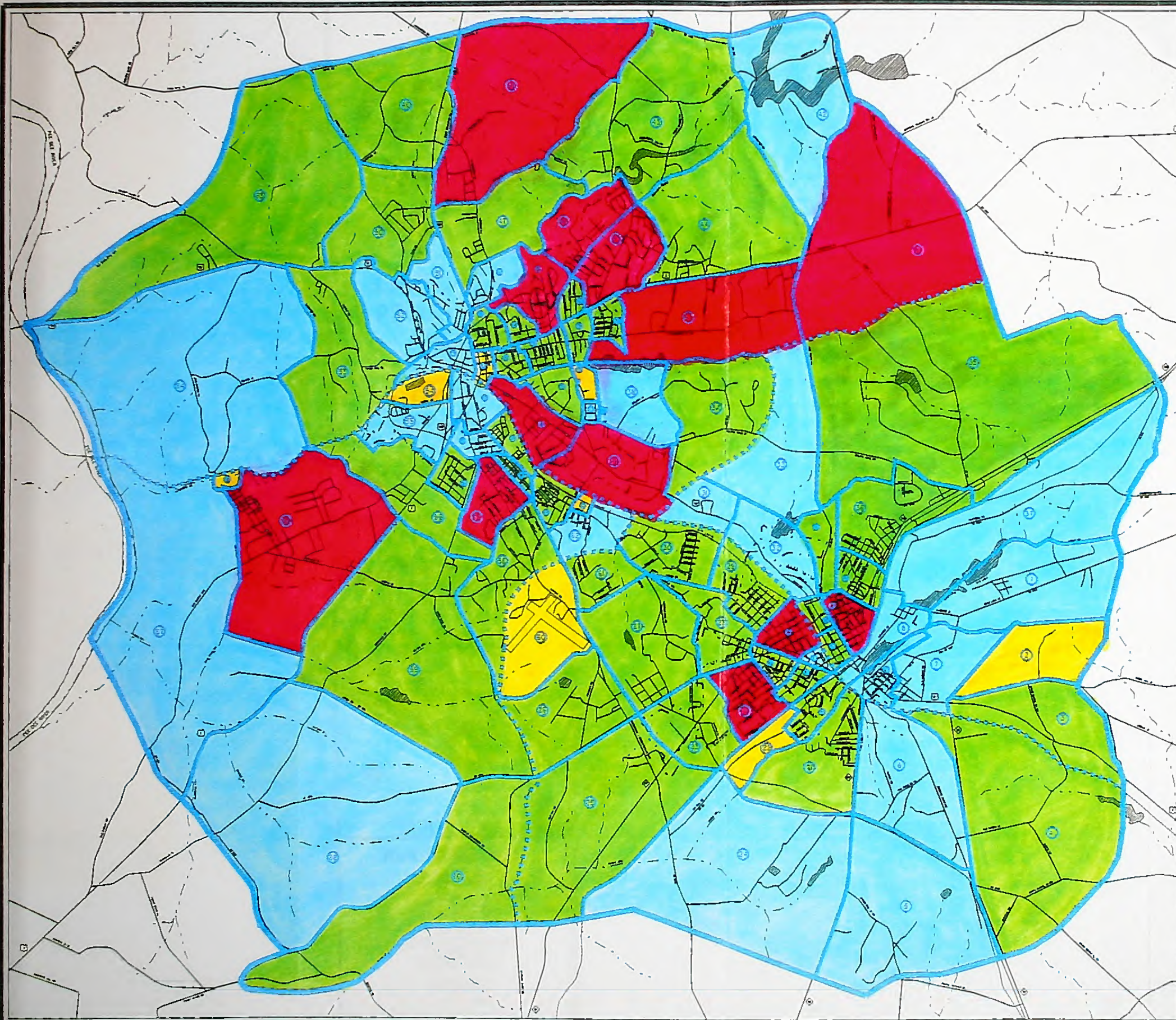
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BASE: 1993



FUTURE GROWTH TRENDS

EMPLOYMENT PROJECTIONS (2020)

EMPLOYMENT:

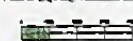
- LOW DENSITY
(0-49 EMPLOYEES)
- MEDIUM DENSITY
(50-149 EMPLOYEES)
- MEDIUM-HIGH DENSITY
(150-299 EMPLOYEES)
- HIGH DENSITY
(300 /+ EMPLOYEES)

FIGURE 7B

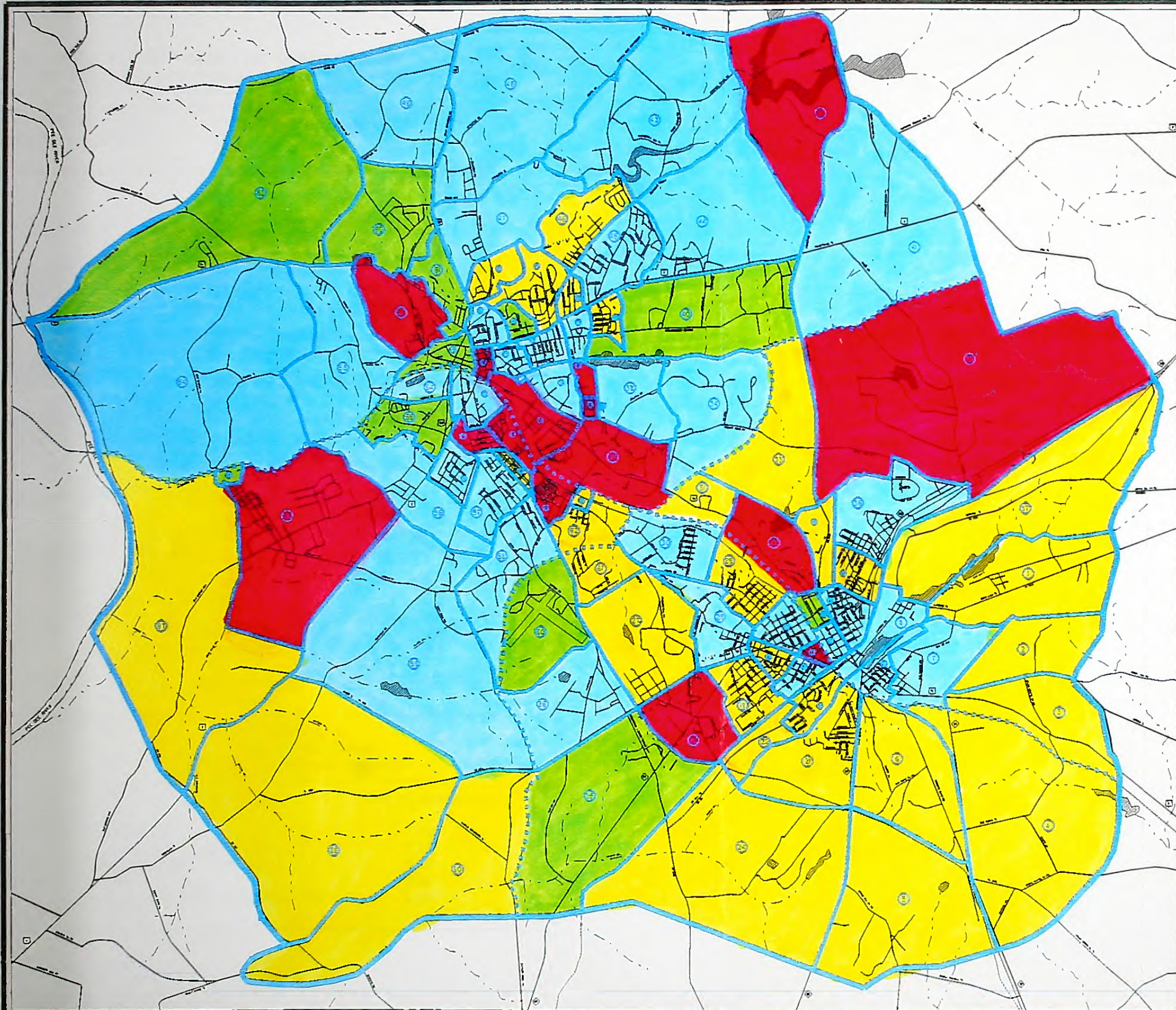
ROCKINGHAM HAMLET

RICHMOND COUNTY
NORTH CAROLINA

Prepared by the
North Carolina Department of Transportation
Division of Highway-Supervisory Planning Branch
in cooperation with
U.S. Department of Transportation
Federal Highway Administration



BASE: 1963





In 1992, the US Bureau of Census released County Employment commuting patterns for every county in North Carolina. This data is based on the 1990 Census of Population and Housing survey and should be used as an indicator of the employment travel patterns only. The following is a statistical summary of Richmond County commuting patterns.

		Persons
Total Out-Commuters	=	3,042
Total In-Commuters	=	2,617
Total Non-Commuters	=	16,915
Persons Working in County	=	19,532
Employed Residents	=	19,957
Net Commuting	=	-425

15.24% of employed residents are Out-Commuters.

13.40% of the employed in county workers are In-Commuters.

Table 4 and 5 list the top 5 county commuters, including In-Commuters and Out-Commuters.

**Table 4
In-Commuters
to Richmond County**

Location of Residence	In-Commuters
Scotland County	573
Marlboro County, SC	573
Anson County	365
Moore County	194
Montgomery County	143

**Table 5
Out-Commuters
from Richmond County**

Location of Work	Out-Commuters
Moore County	734
Scotland County	591
Montgomery County	422
Anson County	322
Chesterfield County, SC	218

VEHICLE REGISTRATION:

The number of registered vehicles in Richmond County for 1994 was 32,952. As the number of vehicles increase, it will put a greater strain on the existing road network. Additional traffic volumes will increase safety hazards and congestion. To alleviate traffic congestion, steps must be taken towards building new roads and enhancement of existing facilities.

Vehicle registration has increased at a much greater rate than population since 1940. This increase can be shown best by a graph depicting the change in persons per vehicle ratio over time. This ratio is obtained by dividing the total population of the area by the total number of vehicles registered in that area. **Figure 8** shows this comparison for North Carolina and Richmond County and includes projections to the year 2020.

The results of this figure illustrate the transition from a non-automobile oriented society to one whose vitality is heavily dependent on the automobile. This change in lifestyle has gradually occurred over many years, with the most dramatic difference being between 1940 and 1960. This is primarily due to: the post-depression increase in the standard of living; the increase in population including the post World War II "Baby Boom"; the transition from an agriculturally dominated society to a more diversified one (fewer people on the farm, greater need for transportation); and the availability of automobiles in the 1960's and 1970's and the banking credit to buy them.

On the basis of the forecasted population and motor vehicle registration trends, traffic volumes on most roads in the County should experience a significant increase in traffic during the 1994-2020 design period. Greater increases are to be expected due to continued increases in commercial and industrial development.

PERSONS/VEHICLE RICHMOND COUNTY & NORTH CAROLINA

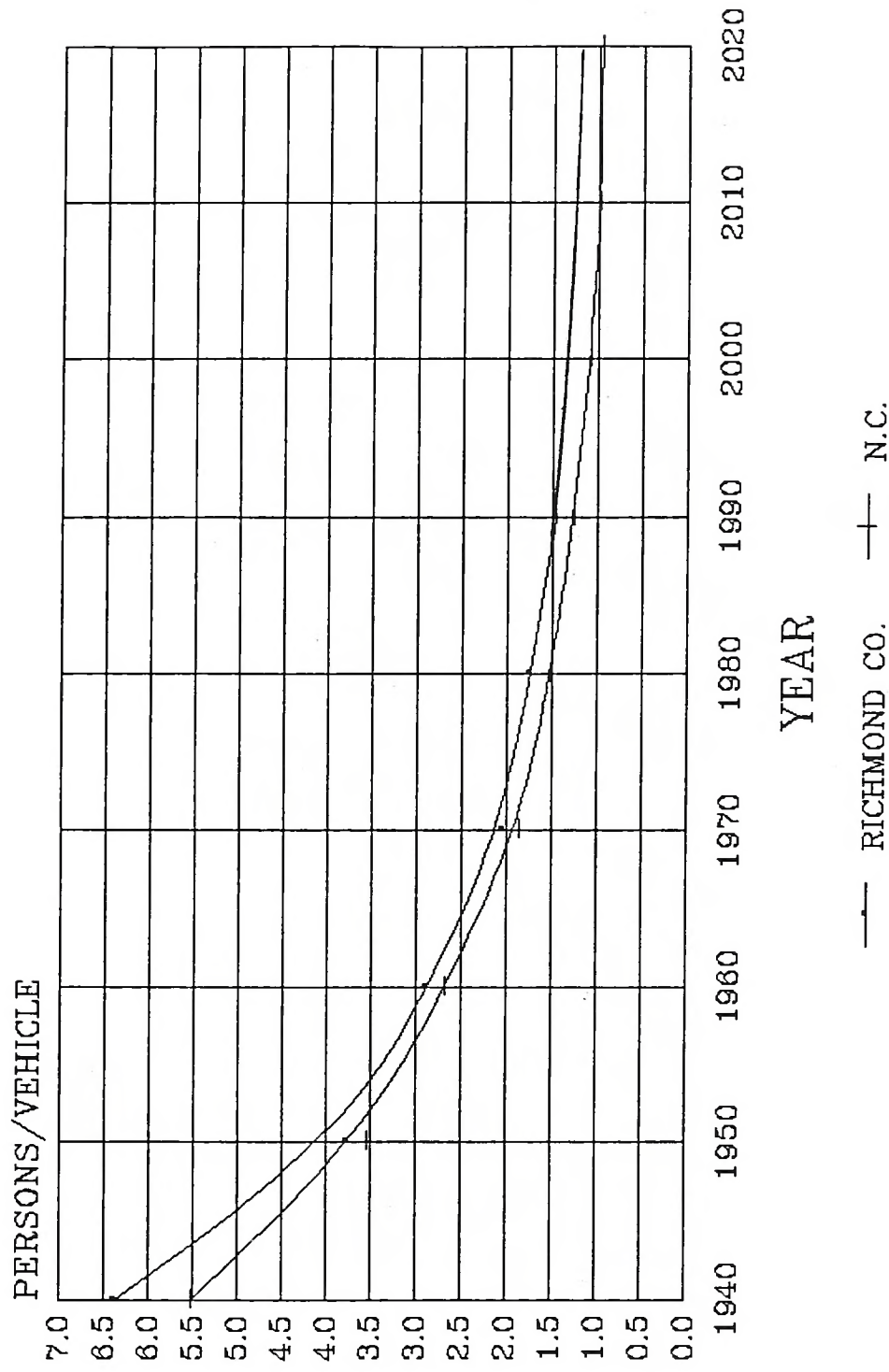


FIGURE 8

VII. EVALUATION OF ALTERNATIVES BASED ON ENVIRONMENTAL IMPACTS

In the past several years, environmental considerations associated with highway construction have come to the forefront of the planning process. The legislation that dictates the necessary procedures regarding the environmental impacts is the National Environmental Policy Act (NEPA). Section 102 of this act requires the execution of an environmental impact statement, or EIS, for road projects that have a significant impact on the environment. Included in an EIS would be the project's impact on wetlands, water quality, wildlife, historic properties and public lands. For projects with less than significant impact, other documents such as CE (Categorical Exclusion) or EA/FONSI (Environmental Assessment/Finding of No significant Impact) may be used. While this report does not cover the environmental concerns in as much detail as a NEPA document would, preliminary research was done on several of these factors and is included below.

PHYSICAL ENVIRONMENTAL CONSIDERATIONS

WATER QUALITY

Water quality is a prime asset of all cities and every effort should be made during highway construction as well as during other construction to adhere to recommended guidelines to ensure the prevention of pollution. Guidelines have been issued outlining procedures for maintaining water quality and the reduction of possible soil erosion occurring during and following highway construction. Obviously, the greater the extent of new construction, the more serious will be the problems relating to conservation and water quality.

The Rockingham-Hamlet planning area has three water intake sites, which are used for local water supply, located on Roberdel Lake, Big Lake and Rockingham City Pond. Each of these intake sites include a critical water shed located in the area behind and around the lakes. One proposed facility may have an impact to the critical water shed area of Rockingham City Pond.

Another concern to water quality is waste sites. Waste sites are waste leaking from underground tanks and sewage disposal. There are three different categories of waste sites. A description of the three categories are as follows: 1) Superfund Sites are critical. A major hazardous waste site with leaking underground tanks. 2) Groundwater Incidents are also leaking underground tanks. However, they are not as critical as superfund sites. 3) National Pollution Discharge Elimination System (NPDES) are sewage discharge outfalls from some type of industry. One proposed project crosses a superfund site and another runs within two miles of a superfund site. These sites will need to be investigated before any construction can occur.

AIR QUALITY

Air quality has been a concern in the planning and construction of roads as early as the Federal Air Pollution Control Act of 1955. This concern continued with the passing of the Clean Air Act of 1970 which set standards on pollution control. This act was later amended in 1977 and more recently in 1990. The 1990 amendment set more stringent standards on mobile source emissions which impacted transportation planning by requiring transportation related provisions. These provisions promote integration of air quality analyses with the transportation process; requirements for determining conformity of transportation plans, programs and projects; expanded use of highway sanctions; and a renewed emphasis on controlling growth in vehicle-miles-traveled (VMT) and reducing congestion levels. In addition, the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 states further integration between state and local transportation planning is needed for conformity with the Clean Air Act.

When mobile source emissions exceed acceptable levels then the area is considered a nonattainment area. These areas must meet deadlines in reducing standard emissions levels. Even though federal law focuses on these nonattainment areas, the attainment areas are also important and should be aimed at remaining classified as such. Rockingham-Hamlet is an attainment area for all pollutants targeted in the 1990 Clean Air Act.

Emissions are reduced when traffic is permitted to flow more smoothly and congestion is reduced which achieves a more efficient use of fuel. Therefore, the design of the thoroughfare system has a notable effect on the amount of emissions because a well designed street network aims at reducing congestion and allowing free flow travel. A street system that provides direct movement between sections of the city reduces travel time and distances, subsequently reducing pollutant emissions. The Rockingham-Hamlet Thoroughfare Plan promotes free flowing travel and reduces congestion which both have a positive effect on maintaining acceptable levels of emissions.

WETLANDS

Wetlands are those lands where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the soil. Wetlands are crucial ecosystems in our environment. They help regulate and maintain the hydrology of our rivers, lakes and streams by slowly storing and releasing flood waters. They help maintain the quality of our water by storing nutrients, reducing sediment loads and reducing erosion. They are also critical to fish and wildlife populations. Wetlands provide an important habitat for about one-third of the plant and animal species that are federally listed as threatened or endangered.

For this study, the impacts to wetlands areas were determined using the National Wetlands Inventory Mapping which is available from the U.S. Fish and Wildlife Service. It is important to note that this mapping is a draft and is the best estimate of the approximate location of wetlands. Development of these maps was based on aerial photography and has not been field checked. Therefore, more extensive environmental investigations are required prior to design of a facility.

Impacts to wetlands from proposed facilities and widenings were determined using available mapping. As a result, all wetland impacts that were found were avoided to the greatest extent possible, while preserving the integrity of the Thoroughfare Plan.

THREATENED AND ENDANGERED SPECIES

A preliminary review of the Federal List of Threatened and Endangered Species within Richmond County was conducted to determine the effects that proposed corridors could have on the wildlife. These species were identified using mapping from the North Carolina Department of Environmental, Health and Natural Resources.

The Threatened and Endangered Species Act of 1973 allows the U.S. Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a road project on endangered plants, animals and critical wildlife habitats. By locating rare species in the planning stage of road construction, it is possible to avoid or minimize these impacts.

There were six federally listed endangered species and one federally listed threatened specie in Richmond County, which follow. None of these were in locations where proposed facilities were recommended. The proposed upgrade of Reicel Road from a dirt path to a two-lane facility is close to a natural occurring event and should be studied before any construction begins. Other species may exist in the area, therefore, a detailed field investigation is recommended prior to construction of any highway project.

Endangered Species:

Acipenser Brevirostrum (Shortnose Sturgeon)
Picodes Borealis (Red-Cockaded Woodpecker) *Lysimachia*
Asperulifolia (Rough-Leaf Loosestrife)
Muhlenbergia Torreyana (Pinebarren Smokegrass)
Rhus Michauxii (Michaux's Sumac)
Rhynchospora Macra (Southern White Beaksedge)

Threatened Species:

Ambystoma Tigrinum (Tiger Salamander)

SOILS AND GEOLOGY

The major soils of Richmond County are gray loam and poor sandy soil. Very little of the soil is classified as good soil. The soils low fertility along with the dryness greatly limits the areas farming capability.

The areas geologic characteristics are typical of the Piedmont Plateau with its triassic sandstone, sandy clays and marl. Most of the rock is from the Tuscaloosa Formation dating back to the early Mesozoic Era. Intrusive complexes of granite, granodiorite, garnet, quartz monzonite, diorite and gabbro are found in the area. Thirteen small diamonds have been found in North Carolina. One of these was found in the gravel beds of Richmond County.

ARCHAEOLOGICAL IMPACTS

The location of recorded archaeological sites was researched to determine possible impacts by proposed projects. Archaeological sites are generally difficult to identify without actually going out to the site and excavating and evaluating information and data obtained. As a result, possible sites might not be identified during the planning process due to this lack of information. Therefore, all thoroughfares should be evaluated individually prior to construction.

SOCIAL ENVIRONMENTAL CONCERNS

HOUSING AND NEIGHBORHOODS

The preservation of cohesive neighborhoods is a fundamental part of thoroughfare planning. By designating certain streets as thoroughfares, heavy traffic is minimized on neighborhood streets which minimizes the negative impacts too much traffic can have on these streets. In order to reduce heavy traffic on residential roads, new facilities need to be constructed and/or existing ones widened. The proposed projects on the thoroughfare plan would require approximately 25 houses, four mobile homes and four storage buildings to construct as determined by a field survey.

EDUCATIONAL FACILITIES

The location of educational facilities in the Rockingham-Hamlet planning area was considered during the development of the thoroughfare plan. No schools will required displacement as a result of the proposed improvements. However, implementation of the thoroughfare plan will have a positive effect on several educational facilities by providing easier access. A good example of this is the additional access provided for the Monroe Avenue Elementary School.

NOISE POLLUTION

The noise level of certain streets is expected to rise due to increased usage. Adverse noise conditions are more prevalent in areas of high traffic congestion and on facilities that are functionally misused. It is an objective of the thoroughfare plan to reduce congestion and thereby either lower or maintain existing noise levels even though there will be more vehicle trips on the street system. The areas of greatest concern in the implementation of a thoroughfare plan are schools, churches, hospitals, and residences where streets widening will reduce setback distances.

During today's highway design process, engineers are taking into consideration noise levels created by highway improvements. Recent research has provided improved techniques to predict the noise levels created by highway improvements and offers measures such as elevating or depressing the roadway, providing different roadway surfaces and installing acoustical barriers to reduce noise levels. Design requirements that restrict the steepness of road grades have for many years helped to reduce truck noise levels.

HISTORIC SITES

The location of historic sites in Rockingham-Hamlet was investigated to determine the possible impacts of the various proposed projects. The federal government has issued guidelines requiring all state transportation departments to make special efforts to preserve historic sites. In addition, the State of North Carolina has issued its own guidelines for the preservation of historic sites. These two pieces of legislation are described below:

National Historic Preservation Act - Section 106 of this act requires the Department of Transportation to identify historic properties listed in the National Register of Historic Places and properties that are eligible to be listed on the register. DOT must consider the impact of its road projects on these properties and consult with the Federal Advisory Council on Historic Preservation.

NC General Statute 121-12(a) - This statute requires DOT to identify historic properties listed on the National Register, but not necessarily those eligible to be listed. DOT must consider impacts and consult with the North Carolina Historical Commission, but is not bound by their recommendations.

Listed Historic Properties:

Bank of Pee Dee (Rockingham)
Great Falls Mill (Rockingham)
The Manufacturers Building (Rockingham)
Richmond County Courthouse (Rockingham)
Roberdel Mill No. 1 (Rockingham)
Seaboard Coast Line Passenger Depot (Hamlet)
(former) U.S. Post Office and Courthouse (Rockingham)
H.C. Watson House (Rockingham)
Covington Plantation House (Rockingham)
Alfred Dockery House (Rockingham)

Eligible Historic Properties:

Dr. R.J. Steele, III, House (Rockingham)
Hamlet High School (Hamlet)

Listed Historic Districts:

Rockingham Historic District (Rockingham)
Main St. Commercial Historic District (Hamlet)

ECONOMIC ENVIRONMENTAL CONCERNS

BUSINESSES

The efficiency of the transportation system can have a significant impact on the economic development and well-being of an area affecting both workers and the business community. Transportation costs are often the critical variables in the economic decision process and may determine the sites of manufacturing concerns, the cost of goods delivered to an area and the relative competitiveness of area industries. As new thoroughfares are constructed and existing ones widened, the improved travel conditions that result, have a positive impact on the overall businesses because construction of new facilities opens up land areas for development. The widening of existing thoroughfares improves the level of service which is attractive to business expansion. The completion of US 74 Bypass and US 1 Bypass will attract new business to the area. Only one proposed project on the thoroughfare plan will require the relocation of one small business.

EMPLOYMENT

Improvement in the level of service provided by the thoroughfare system will reduce transportation costs for industry, facilitate industrial employment expansion, and contribute to area income through additional business activity and reduced transportation costs for workers. Employment is directly affected by opportunities to promote development of new business and expansion of existing ones. An adequate thoroughfare plan will improve the future economic vitality of Rockingham-Hamlet.

LAND DEVELOPMENT

Thoroughfare improvements on new locations can stimulate land development by opening new land to development. However, land development is also affected by the overall economic activity, availability of public utilities and services, and many other factors.

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VIII. MODEL DEVELOPMENT

TRAVEL MODEL AND ESTIMATES

Three different surveys are conducted to collect data for a typical thoroughfare plan study. The surveys provide data about existing housing, employment, and traffic in each traffic zone in the planning area. **Figure 9** shows the location of the 91 traffic zones.

DWELLING UNIT SURVEY:

The 1994 housing survey results are shown in **Table A-1**. Each dwelling unit in a traffic zone was classified according to a residence cost level--Excellent (EXC), Above Average (AAV), Average (AVG), Below Average (BAV), and Poor. The data was collected by field inspection. The number of units in each zone were multiplied by an estimated number of persons per dwelling unit for each classification. (Future housing projections are shown in **Table A-1b**)

The estimated 1994 population is listed in **Table A-2**. This serves as a control total for planning area population estimates and for survey accuracy checks.

EMPLOYMENT SURVEY:

The results of the 1994 employment survey are shown in **Table A-5**. The businesses in the planning area were classified by their Standard Identification Code, which is set by the Federal government. Information on employment, commercial trucks and autos was collected. (Future employment projections are shown in **Table A-5b**)

** Employment/population ratio for 1994 = 0.46

TRAFFIC COUNTS:

Traffic counts were taken on various streets throughout the planning area. A count was taken at each station where a road crosses the planning boundary and a selection of streets inside the area. These were then used to calibrate the network model to correspond to the existing traffic conditions in the area.

GENERAL MODELING PROCEDURES:

Since no home interviews or Origin-Destination surveys were conducted, a synthetic method was used to estimate 1994 internal trip patterns. The method consists of these general steps:

1. Determination of zone trip productions using dwelling unit trip generation rates from a previous study in Rockingham\Hamlet. The initial trip generation rates were adjusted as a result of the model calibration. The list of trip generation rates for the base year 1994 are shown below.

Dwelling Unit Rating:	EXC	AAV	AVE	B-AVE	POOR
Generation Rate:	12.00	10.00	9.50	7.00	6.00

2. Determination of trip attraction factors using multiple linear regression procedures based primarily on employment. Again, this was based primarily on past studies.
3. Distribution of resulting trips using a four-purpose gravity model with expanded trip length frequency curves previously developed that reflect an enlarged study area. The trip purposes for Rockingham\Hamlet are home-based work, other home-based, non-home-based, internal-external, taxi, truck, and commercial vehicles.
4. Traffic assignments and accuracy checks so the network model corresponds to existing ground counts.

1994 INTERNAL TRIP PRODUCTIONS:

Internal trip productions were estimated on a zonal basis in three categories: (1) trips produced by dwelling units, (2) trips produced by commercially owned passenger cars, and (3) trips produced by commercial trucks and taxis. Dwelling unit trip generation rates were adjusted from previous studies to account for the expanded planning area and changes in travel habits over time.

The trips produced were summed to produce total internally generated trips (87% Internal of total trips). That is, 87% of the total internal generated trips remained in the planning area. The remaining 13% were trips that had internal origins and travelled outside the planning area. These internal-external trips were distributed to the zones as external trips. They were removed from the internal trips and the remaining trips were used to synthesize internal travel.

The adjusted internal trips were separated into three purposes--home based work (HBW), 23%; non-home based (NHB), 30%; and other home based (OHB), 47%.

The Rockingham\Hamlet area is important to the economy of Richmond County, and therefore, draws a large number of trips from outside the planning area. The number of secondary internal (NHB) trips attributable to external-internal traffic was calculated to be 13,817 in the base year. That is, vehicles garaged outside the planning area making external-internal trips were assumed to be making 13,817 trips per day while within the study area (e.g. to go to lunch, stop by the store, etc.). Distribution of these trips within the study area was made by merging them with the internally produced NHB trips and distributing them according to each zone's relative attractiveness.

The calculation of Secondary Non Home-Based trips for the base year 1994 and the design year 2020 are as follows:

ZONE MAP

LEGEND

-  CORDON LINE
-  SCREEN LINE
-  ZONE LINE
-  # ZONE NUMBER

FIGURE 9

ROCKINGHAM HAMLET

RICHMOND COUNTY
NORTH CAROLINA

Prepared by the
North Carolina Department of Transportation
Division of Highways-Statistical Planning Branch
in cooperation with
U.S. Department of Transportation
Federal Highway Administration



BASE: 1993



TABLE 6
DEVELOPMENT OF SECONDARY NON HOME-BASED TRIPS

1. For Base Year

$$\begin{array}{l} \text{Base Year} \\ \text{Secondary} \\ \text{NHB Trips} \end{array} = \left[\begin{array}{r} \text{Total External} \\ \text{Trips} \end{array} - \begin{array}{r} \text{Int-Ext Trips Garaged} \\ \text{- Inside the Planning Area} \end{array} \right] \times 0.55$$

$$1994 \text{ NHB}_{\text{sec}} = (40,514 - 15,393) \times 0.55 = 13,817 \quad (\text{use } 13,800)$$

2. For Future Year

2020

Future Year

$$\begin{array}{l} \text{Secondary} \\ \text{NHB Trips} \end{array} = (77,092 - 20,484) \times 0.55 = 31,134 \quad (\text{use } 31,000)$$

1994 INTERNAL TRIP ATTRACTIONS:

The trip attraction factors for home based work trips were assumed to be total employment within the zones. Trip attraction factors for other home based (OHB) trips and non-home based (NHB) trips were assumed to be identical and were found using a regression equation modified from the previous thoroughfare plan study. The general equation for estimating trip attraction factors was as follows.

$$Y = 18.51 + 1.00X_1 + 2.45X_2 + 8.36X_3 + 2.60X_4 + 3.26X_5 + 0.30X_6$$

With variable definition as follows:

	Standard Industrial Code
Y = Attraction factor	
X₁ = Industrial	1-49
X₂ = Retail	50-54, 56, 57, 59
X₃ = Highway Retail	55, 58
X₄ = Office and Institutional	60-67, 91-97
X₅ = Service	70-76, 78-89, 99
X₆ = All Dwelling Units	

This analysis yields a relative attraction factor that must then be factored to match productions. Zone attractions were also adjusted to match productions.

TRIP DISTRIBUTION:

The gravity model trip distribution program was used to distribute internal trips. Data input into this program included:

1. zone-to-zone travel times obtained from minimum time paths for the 1994 major street network;
2. zonal trip productions and attractions; and
3. friction factors from calibrated trip length frequency curves.

1994 EXTERNAL-INTERNAL AND THROUGH TRIPS:

Through trips for the planning area were established using a computer program which synthesizes the distribution of traffic between the external stations (cordon). Through trip-ends are the result of subtracting external-internal trips and internal-external trips from cordon station volumes.

TRAFFIC ASSIGNMENT:

Assignment techniques are based on variables such as travel time, and distance. The most widely used factor is time. Traffic volumes were assigned to the network using a computer program which constructs minimum-time paths between zone centroids. The traffic was then loaded onto the network using a stochastic loading method which loads all the traffic on those links along the path with the shortest time between centroids. That is, trips are assigned to all "reasonable" paths between each origin and destination, each path receiving a fraction of interzonal trips.

ACCURACY CHECKS:

The traffic model was used to simulate existing traffic patterns. It's accuracy was tested using two screenlines of reference in the network. On each street crossed by a screenline a traffic count was taken. During calibration of the model the assigned traffic volumes are compared to the actual ground counts for those streets. The results of the accuracy checks are in **Table 7**. The screenlines appear on the zone map in **Figure 9**.

TABLE 7 SCREENLINE CHECK			
SCREENLINE	COUNT	MODEL	%ACCURACY
A	37,940	36,777	97
B	46,840	49,410	105
TOTAL	84,780	86,187	102

A comparison of assigned traffic to existing ground counts is given in **Table 8**.

TABLE 8 GROUND COUNT COMPARISON						
VOL GROUP	NO SECT	AVE COUNT	AVE PROJ VOL	AVE DIFF	STAND DEV	PCT AVE COUNT
1- 1000	144	469	524	-54	714	111.7
1001- 2000	64	1484	1390	94	515	93.7
2001- 3000	28	2343	1950	393	895	83.2
3001- 5000	24	3947	3313	634	1136	83.9
5001- 7000	26	5923	4676	1247	1988	78.9
7001- 10000	14	8115	8492	-376	2285	104.6
10001- 15000	5	11982	10135	1847	4827	84.6
TOTAL	305	2132	1933	199	1278	91.7

2020 TRAVEL DESIRES:

The calibrated traffic model was then used to determine the impact the future travel desires in the year 2020 would have on the present major road network for the area. This was compared to the impact the existing 1994 travel desires have on the same network. The results of the comparison are in **Table 9**.

TABLE 9 STUDY AREA INTERNAL TRIP DATA			
	1994	2020	%CHANGE
DWELLING UNITS	13962	17423	% 25
POPULATION	33511	38313	14
EMPLOYMENT	15568	17821	14
INTERNAL TRIPS	98675	137087	39
HOME BASED WORK	22695	31530	39
HOME BASED OTHER	46377	64431	39
NON-HOME BASED	29603	41126	39
(Internl only)			
INTERNAL-EXTERNAL TRIPS	14745	20484	39
THROUGH TRIPS	11634	28554	145
TOTAL TRIPS PRODUCED			
BY HOUSING UNITS	113420	157571	39

2020 INTERNAL TRIPS:

The 2020 internal travel patterns were estimated using the same procedure as the base year travel patterns. Socio-economic data projected to the year 2020 was used to determine the future year patterns. The data was provided by the Planning Departments of Rockingham and Hamlet. The trip productions and attractions were again distributed using the same gravity model. The trip generation rates were adjusted using a composite factor to reflect future growth. See below for calculations. The internal data estimates are in **Table A-1b**. The employment estimates are in **Table A-5b**.

Travel Model Input Variables

TRIP PERCENTAGES BY PURPOSE	
Internal of Total	87%
HBW	23%
OHB	47%
NHB	30%

YEAR	PERSONS PER DWELLING UNIT	PERSONS PER VEHICLE
1994	2.40	1.42
2020	2.20	1.15

$$\text{COMPOSITE FACTOR} = \frac{1994 \text{ PERSONS/VEHICLE}}{2020 \text{ PERSONS/VEHICLE}} \times \text{USAGE FACTOR} \times \frac{2020 \text{ PERSONS/DU}}{1994 \text{ PERSONS/DU}}$$

$$\text{INCREASE FOR GENERATION RATES} = \frac{\text{AVE. 1994 TRIP RATE}}{\text{COMPOSITE FACTOR}} - \text{AVERAGE 1994 TRIP RATE}$$

EXAMPLE:

$$\text{COMPOSITE FACTOR} = \frac{1.42}{1.15} \times \frac{2.20}{2.40} \times 0.99 = 1.12$$

$$\text{INCREASE FOR GENERATION RATES} = (8.12 \times 1.12) - 8.12 = 0.970 \text{ (use 0.90)}$$

Trip Generation Rates						
YEAR	EXCELLENT	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	OVERALL AVERAGE
1994	12.00	10.00	9.50	7.00	6.00	8.12 *
INCREASE	0.90	0.90	0.90	0.90	0.90	----
2020	12.90	10.90	10.40	7.90	6.90	9.04 *

* Calculated from the IDS computer program

2020 EXTERNAL AND THROUGH TRIPS:

External and through traffic volumes at the stations were projected to 2020 using adjusted historical trends. The results are in **Table 10**.

TABLE 10 STATION VOLUME PROJECTIONS			
STATION #	DESCRIPTION	1990 ADT	2020 ADT
101	NC 381	1220	2300
102	SR 1800	500	1000
103	SR 1801	300	1000
104	US 74 EAST	12870	27700
105	OLD HAUREL RD	1140	2150
106	SR 1608	290	800
107	SR 1607	200	800
108	NC 117 NORTH	3400	6450
109	US 1 NORTH	5040	9600
110	MORRISON ROAD	752	1450
111	LED BETTER RD	1330	2550
112	SR 1441	1790	3400
113	SANDHILL RD	910	1750
114	US 220 NORTH	11240	24200
115	SR 1304	500	1000
116	PRISON CAMP RD	600	1300
117	BUCK WALL RD	300	800
118	BLEWETT ROAD	150	800
119	US 74 WEST	11060	23800
120	OLD CHERAW RD	380	900
121	US 1 SOUTH	3010	5700
122	SANDHILL ROAD	320	900
123	SR 1996	150	800
124	OSBORNE ROAD	160	800
125	BATLEY DAIRY RD	450	1000
126	NC 117 SOUTH	1540	2950
127	SR 1825	1560	3000
128	NC 38 SOUTH	2360	4500
129	SR 1804	260	800

APPENDIX A

APPENDIX A -- SOCIO-ECONOMIC DATA

Three different surveys are conducted to collect data for a typical thoroughfare plan study. The surveys provide data about existing housing, employment, and traffic in each traffic zone in the planning area.

A. DWELLING UNIT SURVEY

The 1994 housing survey results are shown in Table A-1. The estimated population is listed in Table A-2.

B. EMPLOYMENT SURVEY

The results of the 1994 employment survey are shown in Table A-5.

TABLE A-1
ROCKINGHAM - HAMLET INTERNAL DATA SUMMARY 1994

ZONE NO	DWELLING UNITS								
	EXC	AAV	AVE	BAV	POOR	SPEC	TRUCK	CAR	TOTDU
1	0	1	28	34	2	0	1	3	65
2	0	0	3	4	2	0	0	0	9
3	0	0	44	55	30	0	1	5	129
4	0	0	48	73	9	0	4	2	130
5	0	1	22	14	3	0	2	0	40
6	0	1	37	42	23	0	2	2	103
7	0	0	16	37	32	0	22	29	85
8	0	0	32	38	0	0	3	16	70
9	0	1	55	50	2	0	0	22	108
10	0	1	115	27	2	0	7	25	145
11	0	0	14	11	0	0	0	40	25
12	0	0	82	35	0	0	5	5	117
13	0	0	36	254	29	0	0	3	319
14	0	0	3	195	34	0	0	1	232
15	0	0	8	158	0	0	0	0	166
16	0	0	59	52	12	0	2	7	123
17	0	14	234	36	1	0	0	0	285
18	0	0	109	54	4	0	0	6	167
19	0	24	220	4	0	0	0	0	248
20	0	0	39	117	3	0	1	54	159
21	0	2	59	73	30	0	1	2	164
22	0	1	9	9	1	0	0	0	20
23	0	0	31	60	13	0	3	5	104
24	0	3	11	19	5	0	7	6	38
25	0	0	52	56	10	0	0	2	118
26	0	0	64	89	2	0	15	10	155
27	0	0	37	118	1	0	2	0	156
28	0	0	155	13	0	0	0	0	168
29	1	12	214	0	0	0	0	0	227
30	0	0	132	63	9	0	0	4	204
31	0	0	19	4	9	0	0	1	32
32	0	0	22	44	41	0	6	15	107
33	0	0	22	67	0	0	0	0	89
34	0	0	69	35	5	0	1	5	109
35	0	2	41	78	1	0	25	38	122
36	0	0	80	110	32	0	1	4	222
37	0	2	15	28	5	0	1	0	50
38	0	1	52	18	1	0	4	3	72
39	0	6	510	47	0	0	17	113	563
40	0	3	64	109	22	0	0	1	198
41	4	48	190	64	1	0	8	13	307
42	1	7	42	36	3	0	0	2	89
43	2	11	102	81	3	0	0	0	199
44	0	8	55	73	33	0	5	9	169
45	0	53	334	147	0	0	3	34	534
46	1	3	262	15	4	0	0	0	285

TABLE A-1
INTERNAL DATA SUMMARY 1994

ZONE NO	EXC	DWELLING UNITS				POOR	SPEC	TRUCK	CAR	TOTDU
		AAV	AVE	BAV						
47	0	0	17	89	1	0	0	1	107	
48	0	0	69	199	19	0	6	0	287	
49	3	6	35	44	76	0	0	11	164	
50	2	10	120	52	40	0	0	31	224	
51	0	0	4	42	94	0	4	1	140	
52	0	0	6	38	77	0	25	30	121	
53	1	1	18	41	164	0	2	8	225	
54	0	0	3	2	27	0	10	21	32	
55	0	0	35	49	38	0	2	8	122	
56	1	7	37	40	42	0	0	1	127	
57	0	0	146	165	14	0	11	13	325	
58	0	1	53	110	10	0	8	16	174	
59	0	3	102	119	17	0	2	3	241	
60	0	0	1	7	1	0	11	22	9	
61	0	1	142	9	0	0	1	8	152	
62	0	0	19	62	4	0	0	0	85	
63	0	0	6	11	1	0	0	0	18	
64	0	0	12	99	41	0	3	8	152	
65	0	0	29	111	9	0	0	4	149	
66	0	0	12	44	64	0	9	17	120	
67	0	0	0	36	116	0	0	3	152	
68	0	3	193	110	0	0	9	56	306	
69	0	0	46	0	0	0	2	16	46	
70	0	0	0	0	0	0	12	15	0	
71	0	0	41	135	4	0	0	26	180	
72	0	1	0	68	12	0	6	26	81	
73	0	0	0	35	31	0	2	19	66	
74	0	0	14	11	2	0	10	106	27	
75	0	15	71	104	0	0	0	9	190	
76	0	2	42	190	37	0	0	7	271	
77	0	0	88	50	7	0	17	1	145	
78	0	25	124	2	0	0	0	0	151	
79	6	76	172	1	0	0	0	0	255	
80	7	29	118	22	4	0	0	1	180	
81	5	10	91	35	1	0	0	12	142	
82	0	0	45	38	1	0	0	1	84	
83	1	7	45	19	40	0	2	38	112	
84	0	6	26	38	32	0	6	7	102	
85	0	0	0	0	0	0	2	1	0	
86	2	21	270	183	213	0	6	12	689	
87	5	12	4	12	17	0	0	5	50	
88	0	1	41	30	0	0	0	0	72	
89	0	2	142	21	1	0	0	0	166	
90	0	0	63	23	26	0	0	0	112	
91	0	0	21	64	98	0	0	18	183	
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	42	444	6370	5306	1800	0	317	1069	13962	

TABLE A-1b
ROCKINGHAM - HAMLET INTERNAL DATA SUMMARY 2020

ZONE NO	EXC	DWELLING UNITS			POOR	SPEC	TRUCK	CAR	TOTDU
		AAV	AVE	BAV					
1	0	2	51	62	4	0	1	3	119
2	0	0	9	12	6	0	0	0	27
3	0	0	56	70	38	0	1	5	164
4	0	0	61	93	11	0	4	2	165
5	0	1	32	21	4	0	2	0	58
6	0	1	50	57	31	0	2	2	139
7	0	0	26	61	52	0	22	29	139
8	0	0	41	48	0	0	3	16	89
9	0	1	73	67	3	0	0	22	144
10	0	1	144	34	2	0	7	25	181
11	0	0	34	27	0	0	0	40	61
12	0	0	107	46	0	0	5	5	153
13	0	0	42	297	34	0	0	3	373
14	0	0	4	240	42	0	0	1	286
15	0	0	11	209	0	0	0	0	220
16	0	0	76	67	16	0	2	7	159
17	0	16	264	41	1	0	0	0	322
18	0	0	132	66	5	0	0	6	203
19	0	29	268	5	0	0	0	0	302
20	0	0	48	143	4	0	1	54	195
21	0	2	72	89	37	0	1	2	200
22	0	2	18	18	2	0	0	0	40
23	0	0	47	91	20	0	3	5	158
24	0	5	17	29	8	0	7	6	59
25	0	0	68	73	13	0	0	2	154
26	0	0	79	110	2	0	15	10	191
27	0	0	46	145	1	0	2	0	192
28	0	0	188	16	0	0	0	0	204
29	1	15	265	0	0	0	0	0	281
30	0	0	167	80	11	0	0	4	258
31	0	0	30	6	14	0	0	1	50
32	0	0	26	52	48	0	6	15	126
33	0	0	27	81	0	0	0	0	108
34	0	0	115	58	8	0	1	5	181
35	0	3	53	101	1	0	25	38	158
36	0	0	99	137	40	0	1	4	276
37	0	3	21	39	7	0	1	0	70
38	0	2	105	36	2	0	4	3	145
39	0	7	621	57	0	0	17	113	685
40	0	5	103	176	36	0	0	1	320
41	6	67	266	89	1	0	8	13	429
42	1	10	59	51	4	0	0	2	125
43	3	15	139	111	4	0	0	0	272
44	0	14	95	127	57	0	5	9	293
45	0	65	412	181	0	0	3	34	658
46	1	4	393	22	6	0	0	0	426

TABLE A-1b
ROCKINGHAM - HAMLET INTERNAL DATA SUMMARY 2020

ZONE NO	EXC	DWELLING UNITS				POOR	SPEC	TRUCK	CAR	TOTDU
		AAV	AVE	BAV						
47	0	0	37	192	2	0	0	0	1	231
48	0	0	78	225	21	0	6	0	0	324
49	3	6	38	47	82	0	0	0	11	176
50	2	11	126	55	42	0	0	0	31	236
51	0	0	4	42	94	0	4	4	1	140
52	0	0	7	42	85	0	25	30	30	134
53	1	1	19	43	173	0	2	8	8	237
54	0	0	3	2	31	0	10	21	21	36
55	0	0	36	51	40	0	2	8	8	127
56	2	11	58	63	66	0	0	1	1	200
57	0	0	151	171	15	0	11	13	13	337
58	0	1	57	118	11	0	8	16	16	187
59	0	3	107	125	18	0	2	3	3	253
60	0	0	2	16	2	0	11	22	22	20
61	0	1	192	12	0	0	1	8	8	205
62	0	0	22	71	5	0	0	0	0	98
63	0	0	10	18	2	0	0	0	0	30
64	0	0	13	107	44	0	3	8	8	164
65	0	0	31	120	10	0	0	4	4	161
66	0	0	13	48	70	0	9	17	17	131
67	0	0	0	39	125	0	0	3	3	164
68	0	3	216	123	0	0	9	56	56	342
69	0	0	58	0	0	0	2	16	16	58
70	0	0	0	0	0	0	12	15	15	0
71	0	0	49	163	5	0	0	26	26	217
72	0	1	0	78	14	0	6	26	26	93
73	0	0	0	41	37	0	2	19	19	78
74	0	0	20	16	3	0	10	106	106	39
75	0	16	75	111	0	0	0	9	9	202
76	0	2	44	198	39	0	0	7	7	283
77	0	0	95	54	8	0	17	1	1	157
78	0	27	134	2	0	0	0	0	0	163
79	9	112	254	1	0	0	0	0	0	376
80	7	31	126	23	4	0	0	1	1	191
81	5	11	99	38	1	0	0	12	12	154
82	0	0	51	43	1	0	0	1	1	95
83	2	12	74	31	66	0	2	38	38	185
84	0	7	29	42	36	0	6	7	7	114
85	0	0	0	0	0	0	2	1	1	0
86	2	25	327	222	258	0	6	12	12	834
87	6	15	5	15	21	0	0	5	5	62
88	0	2	62	45	0	0	0	0	0	109
89	0	2	152	23	1	0	0	0	0	178
90	0	0	84	31	35	0	0	0	0	150
91	0	0	22	68	104	0	0	18	18	194
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	51	570	8040	6616	2146	0	317	1069	17423	

TABLE A-2 - 1994
ROCKINGHAM - HAMLET POPULATION

ZONE NO.	EXC	AAV	AVE	BAV	POOR	SPEC	TPOP
1	0	2	67	82	5	0	156
2	0	0	7	10	5	0	22
3	0	0	106	132	72	0	310
4	0	0	115	175	22	0	312
5	0	2	53	34	7	0	96
6	0	2	89	101	55	0	247
7	0	0	38	89	77	0	204
8	0	0	77	91	0	0	168
9	0	2	132	120	5	0	259
10	0	2	276	65	5	0	348
11	0	0	34	26	0	0	60
12	0	0	197	84	0	0	281
13	0	0	86	610	70	0	766
14	0	0	7	468	82	0	557
15	0	0	19	379	0	0	398
16	0	0	142	125	29	0	296
17	0	34	562	86	2	0	684
18	0	0	262	130	10	0	402
19	0	58	528	10	0	0	596
20	0	0	94	281	7	0	382
21	0	5	142	175	72	0	394
22	0	2	22	22	2	0	48
23	0	0	74	144	31	0	249
24	0	7	26	46	12	0	91
25	0	0	125	134	24	0	283
26	0	0	154	214	5	0	373
27	0	0	89	283	2	0	374
28	0	0	372	31	0	0	403
29	2	29	514	0	0	0	545
30	0	0	317	151	22	0	490
31	0	0	46	10	22	0	78
32	0	0	53	106	98	0	257
33	0	0	53	161	0	0	214
34	0	0	166	84	12	0	262
35	0	5	98	187	2	0	292
36	0	0	192	264	77	0	533
37	0	5	36	67	12	0	120
38	0	2	125	43	2	0	172
39	0	14	1224	113	0	0	1351
40	0	7	154	262	53	0	476
41	10	115	456	154	2	0	737
42	2	17	101	86	7	0	213
43	5	26	245	194	7	0	477
44	0	19	132	175	79	0	405
45	0	127	802	353	0	0	1282
46	2	7	629	36	10	0	684

TABLE A-2
POPULATION

ZONE NO.	EXC	AAV	AVE	BAV	POOR	SPEC	TPOP
47	0	0	41	214	2	0	257
48	0	0	166	478	46	0	690
49	7	14	84	106	182	0	393
50	5	24	288	125	96	0	538
51	0	0	10	101	226	0	337
52	0	0	14	91	185	0	290
53	2	2	43	98	394	0	539
54	0	0	7	5	65	0	77
55	0	0	84	118	91	0	293
56	2	17	89	96	101	0	305
57	0	0	350	396	34	0	780
58	0	2	127	264	24	0	417
59	0	7	245	286	41	0	579
60	0	0	2	17	2	0	21
61	0	2	341	22	0	0	365
62	0	0	46	149	10	0	205
63	0	0	14	26	2	0	42
64	0	0	29	238	98	0	365
65	0	0	70	266	22	0	358
66	0	0	29	106	154	0	289
67	0	0	0	86	278	0	364
68	0	7	463	264	0	0	734
69	0	0	110	0	0	0	110
70	0	0	0	0	0	0	0
71	0	0	98	324	10	0	432
72	0	2	0	163	29	0	194
73	0	0	0	84	74	0	158
74	0	0	34	26	5	0	65
75	0	36	170	250	0	0	456
76	0	5	101	456	89	0	651
77	0	0	211	120	17	0	348
78	0	60	298	5	0	0	363
79	14	182	413	2	0	0	611
80	17	70	283	53	10	0	433
81	12	24	218	84	2	0	340
82	0	0	108	91	2	0	201
83	2	17	108	46	96	0	269
84	0	14	62	91	77	0	244
85	0	0	0	0	0	0	0
86	5	50	648	439	511	0	1653
87	12	29	10	29	41	0	121
88	0	2	98	72	0	0	172
89	0	5	341	50	2	0	398
90	0	0	151	55	62	0	268
91	0	0	50	154	235	0	439
-----	99	1060	15292	12739	4321	-----	33511

OCCUPANCY RATES: ROCKINGHAM - HAMLET (1994)

EXC	AAV	AV	BA	POOR	SP
2.40	2.40	2.40	2.40	2.40	2.40

TABLE A-2b - 2020
ROCKINGHAM - HAMLET POPULATION

ZONE NO.	EXC	AAV	AVE	BAV	POOR	SPEC	TPOP
1	0	4	112	136	9	0	261
2	0	0	20	26	13	0	59
3	0	0	123	154	84	0	361
4	0	0	134	205	24	0	363
5	0	2	70	46	9	0	127
6	0	2	110	125	68	0	305
7	0	0	57	134	114	0	305
8	0	0	90	106	0	0	196
9	0	2	161	147	7	0	317
10	0	2	317	75	4	0	398
11	0	0	75	59	0	0	134
12	0	0	235	101	0	0	336
13	0	0	92	653	75	0	820
14	0	0	9	528	92	0	629
15	0	0	24	460	0	0	484
16	0	0	167	147	35	0	349
17	0	35	581	90	2	0	708
18	0	0	290	145	11	0	446
19	0	64	590	11	0	0	665
20	0	0	106	315	9	0	430
21	0	4	158	196	81	0	439
22	0	4	40	40	4	0	88
23	0	0	103	200	44	0	347
24	0	11	37	64	18	0	130
25	0	0	150	161	29	0	340
26	0	0	174	242	4	0	420
27	0	0	101	319	2	0	422
28	0	0	414	35	0	0	449
29	2	33	583	0	0	0	618
30	0	0	367	176	24	0	567
31	0	0	66	13	31	0	110
32	0	0	57	114	106	0	277
33	0	0	59	178	0	0	237
34	0	0	253	128	18	0	399
35	0	7	117	222	2	0	348
36	0	0	218	301	88	0	607
37	0	7	46	86	15	0	154
38	0	4	231	79	4	0	318
39	0	15	1366	125	0	0	1506
40	0	11	227	387	79	0	704
41	13	147	585	196	2	0	943
42	2	22	130	112	9	0	275
43	7	33	306	244	9	0	599
44	0	31	209	279	125	0	644
45	0	143	906	398	0	0	1447
46	2	9	865	48	13	0	937

TABLE A-2b
POPULATION

ZONE NO.	EXC	AAV	AVE	BAV	POOR	SPEC	TPOP
47	0	0	81	422	4	0	507
48	0	0	172	495	46	0	713
49	7	13	84	103	180	0	387
50	4	24	277	121	92	0	518
51	0	0	9	92	207	0	308
52	0	0	15	92	187	0	294
53	2	2	42	95	381	0	522
54	0	0	7	4	68	0	79
55	0	0	79	112	88	0	279
56	4	24	128	139	145	0	440
57	0	0	332	376	33	0	741
58	0	2	125	260	24	0	411
59	0	7	235	275	40	0	557
60	0	0	4	35	4	0	43
61	0	2	422	26	0	0	450
62	0	0	48	156	11	0	215
63	0	0	22	40	4	0	66
64	0	0	29	235	97	0	361
65	0	0	68	264	22	0	354
66	0	0	29	106	154	0	289
67	0	0	0	86	275	0	361
68	0	7	475	271	0	0	753
69	0	0	128	0	0	0	128
70	0	0	0	0	0	0	0
71	0	0	108	359	11	0	478
72	0	2	0	172	31	0	205
73	0	0	0	90	81	0	171
74	0	0	44	35	7	0	86
75	0	35	165	244	0	0	444
76	0	4	97	436	86	0	623
77	0	0	209	119	18	0	346
78	0	59	295	4	0	0	358
79	20	246	559	2	0	0	827
80	15	68	277	51	9	0	420
81	11	24	218	84	2	0	339
82	0	0	112	95	2	0	209
83	4	26	163	68	145	0	406
84	0	15	64	92	79	0	250
85	0	0	0	0	0	0	0
86	4	55	719	488	568	0	1834
87	13	33	11	33	46	0	136
88	0	4	136	99	0	0	239
89	0	4	334	51	2	0	391
90	0	0	185	68	77	0	330
91	0	0	48	150	229	0	427
-----	110	1248	17686	14551	4718	0	38313

OCCUPANCY RATES: ROCKINGHAM - HAMLET (2020)

EXC	AAV	AV	BA	POOR	SP
2.20	2.20	2.20	2.20	2.20	2.20

TABLE A-3
(1994) TRIPS BY DWELLING UNIT

ZONE NO	EXC	AAV	AVE	BAV	POOR	SPEC	TOTAL TRIPS	TRUCK	CAR	TOTAL TRIPS
1	0	10	266	272	12	0	560	7	20	27
2	0	0	29	32	12	0	73	0	0	0
3	0	0	418	440	180	0	1038	7	34	41
4	0	0	456	584	54	0	1094	27	14	41
5	0	10	209	112	18	0	349	14	0	14
6	0	10	352	336	138	0	836	14	14	28
7	0	0	152	296	192	0	640	150	197	347
8	0	0	304	304	0	0	608	20	109	129
9	0	10	523	400	12	0	945	0	150	150
10	0	10	1093	216	12	0	1331	48	170	218
11	0	0	133	88	0	0	221	0	272	272
12	0	0	779	280	0	0	1059	34	34	68
13	0	0	342	2032	174	0	2548	0	20	20
14	0	0	29	1560	204	0	1793	0	7	7
15	0	0	76	1264	0	0	1340	0	0	0
16	0	0	561	416	72	0	1049	14	48	62
17	0	140	2223	288	6	0	2657	0	0	0
18	0	0	1036	432	24	0	1492	0	41	41
19	0	240	2090	32	0	0	2362	0	0	0
20	0	0	371	936	18	0	1325	7	367	374
21	0	20	561	584	180	0	1345	7	14	21
22	0	10	86	72	6	0	174	0	0	0
23	0	0	295	480	78	0	853	20	34	54
24	0	30	105	152	30	0	317	48	41	89
25	0	0	494	448	60	0	1002	0	14	14
26	0	0	608	712	12	0	1332	102	68	170
27	0	0	352	944	6	0	1302	14	0	14
28	0	0	1473	104	0	0	1577	0	0	0
29	12	120	2033	0	0	0	2165	0	0	0
30	0	0	1254	504	54	0	1812	0	27	27
31	0	0	181	32	54	0	267	0	7	7
32	0	0	209	352	246	0	807	41	102	143
33	0	0	209	536	0	0	745	0	0	0
34	0	0	656	280	30	0	966	7	34	41
35	0	20	390	624	6	0	1040	170	258	428
36	0	0	760	880	192	0	1832	7	27	34
37	0	20	143	224	30	0	417	7	0	7
38	0	10	494	144	6	0	654	27	20	47
39	0	60	4845	376	0	0	5281	116	768	884
40	0	30	608	872	132	0	1642	0	7	7
41	48	480	1805	512	6	0	2851	54	88	142
42	12	70	399	288	18	0	787	0	14	14
43	24	110	969	648	18	0	1769	0	0	0
44	0	80	523	584	198	0	1385	34	61	95
45	0	530	3173	1176	0	0	4879	20	231	251
46	12	30	2489	120	24	0	2675	0	0	0

TABLE A-3
(1994) TRIPS BY DWELLING UNIT

ZONE NO	EXC	AAV	AVE	BAV	POOR	SPEC	TOTAL TRIPS	TRUCK	CAR	TOTAL TRIPS
47	0	0	162	712	6	0	880	0	7	7
48	0	0	656	1592	114	0	2362	41	0	41
49	36	60	333	352	456	0	1237	0	75	75
50	24	100	1140	416	240	0	1920	0	211	211
51	0	0	38	336	564	0	938	27	7	34
52	0	0	57	304	462	0	823	170	204	374
53	12	10	171	328	984	0	1505	14	54	68
54	0	0	29	16	162	0	207	68	143	211
55	0	0	333	392	228	0	953	14	54	68
56	12	70	352	320	252	0	1006	0	7	7
57	0	0	1387	1320	84	0	2791	75	88	163
58	0	10	504	880	60	0	1454	54	109	163
59	0	30	969	952	102	0	2053	14	20	34
60	0	0	10	56	6	0	72	75	150	225
61	0	10	1349	72	0	0	1431	7	54	61
62	0	0	181	496	24	0	701	0	0	0
63	0	0	57	88	6	0	151	0	0	0
64	0	0	114	792	246	0	1152	20	54	74
65	0	0	276	888	54	0	1218	0	27	27
66	0	0	114	352	384	0	850	61	116	177
67	0	0	0	288	696	0	984	0	20	20
68	0	30	1834	880	0	0	2744	61	381	442
69	0	0	437	0	0	0	437	14	109	123
70	0	0	0	0	0	0	0	82	102	184
71	0	0	390	1080	24	540	2034	0	177	177
72	0	10	0	544	72	0	626	41	177	218
73	0	0	0	280	186	0	466	14	129	143
74	0	0	133	88	12	0	233	68	721	789
75	0	150	675	832	0	416	2073	0	61	61
76	0	20	399	1520	222	0	2161	0	48	48
77	0	0	836	400	42	0	1278	116	7	123
78	0	250	1178	16	0	0	1444	0	0	0
79	72	760	1634	8	0	0	2474	0	0	0
80	84	290	1121	176	24	0	1695	0	7	7
81	60	100	865	280	6	0	1311	0	82	82
82	0	0	428	304	6	0	738	0	7	7
83	12	70	428	152	240	0	902	14	258	272
84	0	60	247	304	192	0	803	41	48	89
85	0	0	0	0	0	0	0	14	7	21
86	24	210	2565	1464	1278	0	5541	41	82	123
87	60	120	38	96	102	0	416	0	34	34
88	0	10	390	240	0	0	640	0	0	0
89	0	20	1349	168	6	0	1543	0	0	0
90	0	0	599	184	156	0	939	0	0	0
91	0	0	200	512	588	0	1300	0	122	122
<hr/>										
	504	4440	60534	42448	10800	956	119682	2162	7271	9433

GENERATION RATES

EXC	AAV	AV	BA	POOR	SPEC	TRK	CAR
12.00	10.00	9.50	8.00	6.00	4.00	6.80	6.80

TABLE A-3b
(2020) TRIPS BY DWELLING UNIT

ZONE NO	EXC	AAV	AVE	BAV	POOR	SPEC	TOTAL TRIPS	TRUCK	CAR	TOTAL TRIPS
1	0	22	530	490	28	0	1070	7	20	27
2	0	0	94	95	41	0	230	0	0	0
3	0	0	582	553	262	0	1397	7	34	41
4	0	0	634	735	76	0	1445	27	14	41
5	0	11	333	166	28	0	538	14	0	14
6	0	11	520	450	214	0	1195	14	14	28
7	0	0	270	482	359	0	1111	150	197	347
8	0	0	426	379	0	0	805	20	109	129
9	0	11	759	529	21	0	1320	0	150	150
10	0	11	1498	269	14	0	1792	48	170	218
11	0	0	354	213	0	0	567	0	272	272
12	0	0	1113	363	0	0	1476	34	34	68
13	0	0	437	2346	235	0	3018	0	20	20
14	0	0	42	1896	290	0	2228	0	7	7
15	0	0	114	1651	0	0	1765	0	0	0
16	0	0	790	529	110	0	1429	14	48	62
17	0	174	2746	324	7	0	3251	0	0	0
18	0	0	1373	521	35	0	1929	0	41	41
19	0	316	2787	40	0	0	3143	0	0	0
20	0	0	499	1130	28	0	1657	7	367	374
21	0	22	749	703	255	0	1729	7	14	21
22	0	22	187	142	14	0	365	0	0	0
23	0	0	489	719	138	0	1346	20	34	54
24	0	54	177	229	55	0	515	48	41	89
25	0	0	707	577	90	0	1374	0	14	14
26	0	0	822	869	14	0	1705	102	68	170
27	0	0	478	1146	7	0	1631	14	0	14
28	0	0	1955	126	0	0	2081	0	0	0
29	13	163	2756	0	0	0	2932	0	0	0
30	0	0	1737	632	76	0	2445	0	27	27
31	0	0	312	47	97	0	456	0	7	7
32	0	0	270	411	331	0	1012	41	102	143
33	0	0	281	640	0	0	921	0	0	0
34	0	0	1196	458	55	0	1709	7	34	41
35	0	33	551	798	7	0	1389	170	258	428
36	0	0	1030	1082	276	0	2388	7	27	34
37	0	33	218	308	48	0	607	7	0	7
38	0	22	1092	284	14	0	1412	27	20	47
39	0	76	6458	450	0	0	6984	116	768	884
40	0	54	1071	1390	248	0	2763	0	7	7
41	77	730	2766	703	7	0	4283	54	88	142
42	13	109	614	403	28	0	1167	0	14	14
43	39	163	1446	877	28	0	2553	0	0	0
44	0	153	988	1003	393	0	2537	34	61	95
45	0	708	4285	1430	0	0	6423	20	231	251
46	13	44	4087	174	41	0	4359	0	0	0

TABLE A-3b
(2020) TRIPS BY DWELLING UNIT

ZONE NO	EXC	AAV	AVE	BAV	POOR	SPEC	TOTAL TRIPS	TRUCK	CAR	TOTAL TRIPS
47	0	0	385	1517	14	0	1916	0	7	7
48	0	0	811	1778	145	0	2734	41	0	41
49	39	65	395	371	566	0	1436	0	75	75
50	26	120	1310	435	290	0	2181	0	211	211
51	0	0	42	332	649	0	1023	27	7	34
52	0	0	73	332	587	0	992	170	204	374
53	13	11	198	340	1194	0	1756	14	54	68
54	0	0	31	16	214	0	261	68	143	211
55	0	0	374	403	276	0	1053	14	54	68
56	26	120	603	498	455	0	1702	0	7	7
57	0	0	1570	1351	104	0	3025	75	88	163
58	0	11	593	932	76	0	1612	54	109	163
59	0	33	1113	988	124	0	2258	14	20	34
60	0	0	21	126	14	0	161	75	150	225
61	0	11	1997	95	0	0	2103	7	54	61
62	0	0	229	561	35	0	825	0	0	0
63	0	0	104	142	14	0	260	0	0	0
64	0	0	135	845	304	0	1284	20	54	74
65	0	0	322	948	69	0	1339	0	27	27
66	0	0	135	379	483	0	997	61	116	177
67	0	0	0	308	863	0	1171	0	20	20
68	0	33	2246	972	0	0	3251	61	381	442
69	0	0	603	0	0	0	603	14	109	123
70	0	0	0	0	0	0	0	82	102	184
71	0	0	510	1288	35	0	1833	0	177	177
72	0	11	0	616	97	0	724	41	177	218
73	0	0	0	324	255	0	579	14	129	143
74	0	0	208	126	21	0	355	68	721	789
75	0	174	780	877	0	0	1831	0	61	61
76	0	22	458	1564	269	0	2313	0	48	48
77	0	0	988	427	55	0	1470	116	7	123
78	0	294	1394	16	0	0	1704	0	0	0
79	116	1221	2642	8	0	0	3987	0	0	0
80	90	338	1310	182	28	0	1948	0	7	7
81	64	120	1030	300	7	0	1521	0	82	82
82	0	0	530	340	7	0	877	0	7	7
83	26	131	770	245	455	0	1627	14	258	272
84	0	76	302	332	248	0	958	41	48	89
85	0	0	0	0	0	0	0	14	7	21
86	26	272	3401	1754	1780	0	7233	41	82	123
87	77	163	52	119	145	0	556	0	34	34
88	0	22	645	356	0	0	1023	0	0	0
89	0	22	1581	182	7	0	1792	0	0	0
90	0	0	874	245	242	0	1361	0	0	0
91	0	0	229	537	718	0	1484	0	122	122
-----	658	6212	83617	52269	14815	-----	157571	2162	7271	9433

GENERATION RATES (2020)

EXC	AAV	AV	BA	POOR	SPEC	TRK	CAR
12.90	10.90	10.40	7.90	6.90	4.90	6.80	6.80

TABLE A-4 - 1994
TRIPS BY PURPOSE

ZONE NO	TOTAL TRIPS	INTERL TRIPS	HBW PROD	HBO PROD	NHB PROD	HBW ATTR	HBO ATTR	NHB ATTR
1	560	487	112	229	15	5	43	26
2	73	64	15	30	4	2	9	8
3	1038	903	208	424	37	23	93	64
4	1094	952	219	447	39	14	97	68
5	349	304	70	143	9	3	26	16
6	836	727	167	342	17	8	57	30
7	640	557	128	262	51	72	100	88
8	608	529	122	249	205	114	315	354
9	945	822	189	386	208	143	330	359
10	1331	1158	266	544	127	82	227	220
11	221	192	44	90	758	501	1090	1308
12	1059	921	212	433	314	192	485	541
13	2548	2217	510	1042	353	138	603	609
14	1793	1560	359	733	47	8	139	80
15	1340	1166	268	548	24	0	86	41
16	1049	913	210	429	755	248	1116	1303
17	2657	2312	532	1087	522	168	834	900
18	1492	1298	299	610	175	60	303	303
19	2362	2055	473	966	36	0	129	63
20	1325	1153	265	542	44	14	112	75
21	1345	1170	269	550	49	17	120	84
22	174	151	35	71	3	0	10	5
23	853	742	171	349	152	566	249	262
24	317	276	63	130	36	26	63	63
25	1002	872	201	410	741	412	1093	1278
26	1332	1159	267	545	442	188	680	763
27	1302	1133	261	533	37	9	102	64
28	1577	1372	316	645	226	100	375	390
29	2165	1884	433	885	36	2	123	62
30	1812	1576	362	741	128	88	246	221
31	267	232	53	109	22	8	42	38
32	807	702	161	330	1179	628	1716	2034
33	745	648	149	305	16	2	51	28
34	966	840	193	395	81	32	150	139
35	1040	905	208	425	356	1132	546	614
36	1832	1594	367	749	244	155	417	421
37	417	363	83	171	9	2	29	16
38	654	569	131	267	38	52	77	65
39	5281	4594	1057	2159	5609	2663	8177	9674
40	1642	1429	329	672	693	329	1050	1195
41	2851	2480	570	1166	184	74	359	318
42	787	685	158	322	154	557	247	265
43	1769	1539	354	723	148	62	273	255
44	1385	1205	277	566	96	40	190	166
45	4879	4245	976	1995	407	154	746	702
46	2675	2327	535	1094	41	0	148	72

TABLE A-4 - 1994
TRIPS BY PURPOSE

ZONE NO	TOTAL TRIPS	INTERL TRIPS	HBW PROD	HBO PROD	NHB PROD	HBW ATTR	HBO ATTR	NHB ATTR
47	880	766	176	360	19	3	61	33
48	2362	2055	473	966	48	3	159	83
49	1237	1076	247	506	177	62	303	305
50	1920	1670	384	785	250	157	427	432
51	938	816	188	384	100	269	186	172
52	823	716	165	337	947	2700	1389	1633
53	1505	1309	301	615	57	31	153	99
54	207	180	41	85	88	114	136	152
55	953	829	191	390	204	271	330	353
56	1006	875	201	411	68	18	137	117
57	2791	2428	558	1141	298	165	526	513
58	1454	1265	291	595	218	94	364	375
59	2053	1786	411	839	138	57	272	237
60	72	63	14	30	169	312	244	291
61	1431	1245	286	585	46	6	113	79
62	701	610	140	287	12	0	45	21
63	151	131	30	62	3	0	9	5
64	1152	1002	230	471	512	935	779	884
65	1218	1060	244	498	33	8	94	58
66	850	740	170	348	175	466	287	301
67	984	856	197	402	233	841	380	402
68	2744	2387	549	1122	2411	1078	3535	4159
69	437	380	87	179	2226	1104	3190	3840
70	0	0	0	0	939	1680	1340	1621
71	2034	1770	407	832	143	135	260	246
72	626	545	125	256	365	180	547	630
73	466	405	93	190	823	325	1195	1420
74	233	203	47	95	3108	1415	4444	5361
75	2073	1804	415	848	215	100	365	370
76	2161	1880	432	884	191	69	358	330
77	1278	1112	256	523	69	72	144	119
78	1444	1256	289	590	111	25	206	191
79	2474	2152	495	1011	39	8	136	68
80	1695	1475	339	693	581	278	885	1002
81	1311	1141	262	536	141	65	246	244
82	738	642	148	302	25	6	61	43
83	902	785	181	369	253	137	396	436
84	803	699	161	329	47	62	99	80
85	0	0	0	0	58	198	83	100
86	5541	4821	1109	2266	633	1324	1118	1092
87	416	362	83	170	20	11	44	34
88	640	557	128	262	29	9	64	50
89	1543	1342	309	631	27	2	90	46
90	939	817	188	384	19	2	62	33
91	1300	1131	260	532	101	62	201	174
119682	104123	23948	48938	31237	23952	48936	53884	

TRIP STATISTICS - 1994

TRIPS PRODUCED BY THE HOUSING UNITS = 119682
INTERNAL OF TOTAL = 87.0% INTERNAL TRIPS = 104123
HBW OF INTERNAL = 23.0% HBW TRIPS = 23948
HBO OF INTERNAL = 47.0% HBO TRIPS = 48938
NHB OF INTERNAL = 30.0% NHB TRIPS = 31237

COMM VEH TRIPS TOTAL = 9433 INTERNAL = 8207
TRIPS PRODUCED BY EXTERNAL STATIONS = 40514
NHB SECONDARY TRIPS = 14437

TABLE A-4b - 2020
TRIPS BY PURPOSE

ZONE NO	TOTAL TRIPS	INTERL TRIPS	HBW PROD	HBO PROD	NHB PROD	HBW ATTR	HBO ATTR	NHB ATTR
1	1070	931	214	438	40	14	101	78
2	230	200	46	94	22	11	42	43
3	1397	1215	279	571	62	43	148	121
4	1445	1257	289	591	79	32	173	154
5	538	468	108	220	28	14	61	55
6	1195	1040	239	489	31	25	96	61
7	1111	967	222	454	80	101	166	157
8	805	700	161	329	295	164	448	576
9	1320	1148	264	540	279	196	447	547
10	1792	1559	359	733	179	112	320	350
11	567	493	113	232	876	628	1256	1713
12	1476	1284	295	603	424	266	654	829
13	3018	2626	604	1234	400	178	702	782
14	2228	1938	446	911	84	18	225	164
15	1765	1536	353	722	39	0	137	76
16	1429	1243	286	584	1039	329	1523	2033
17	3251	2828	650	1329	397	212	680	777
18	1929	1678	386	789	228	86	397	446
19	3143	2734	629	1285	53	0	188	104
20	1657	1442	332	678	111	58	230	218
21	1729	1504	346	707	84	36	193	164
22	365	318	73	149	7	0	25	14
23	1346	1171	269	550	205	704	347	401
24	515	448	103	211	82	59	138	161
25	1374	1195	275	562	831	525	1228	1627
26	1705	1483	341	697	599	248	915	1172
27	1631	1419	326	667	123	52	245	241
28	2081	1810	416	851	270	146	456	528
29	2932	2551	587	1199	67	11	200	132
30	2445	2127	489	1000	189	131	362	370
31	456	397	91	187	127	50	198	249
32	1012	880	202	414	1229	776	1778	2405
33	921	801	184	376	49	18	108	95
34	1709	1487	342	699	185	95	329	362
35	1389	1208	278	568	440	1366	679	862
36	2388	2078	478	977	321	196	555	628
37	607	528	121	248	67	43	121	132
38	1412	1228	282	577	85	119	174	166
39	6984	6076	1397	2856	9543	3304	13692	18672
40	2763	2404	553	1130	766	443	1198	1499
41	4283	3726	857	1751	303	144	588	594
42	1167	1015	233	477	197	669	325	386
43	2553	2221	511	1044	188	90	367	369
44	2537	2207	508	1037	202	104	393	395
45	6423	5588	1285	2626	529	198	990	1035
46	4359	3792	872	1782	75	0	265	147

TABLE A-4b - 2020
TRIPS BY PURPOSE

ZONE NO	TOTAL TRIPS	INTERL TRIPS	HBW PROD	HBO PROD	NHB PROD	HBW ATTR	HBO ATTR	NHB ATTR
47	1916	1667	383	783	181	117	342	355
48	2734	2379	547	1118	245	117	466	479
49	1436	1249	287	587	493	185	760	964
50	2181	1897	436	892	439	297	706	858
51	1023	890	205	418	157	428	273	306
52	992	863	198	406	1122	3236	1630	2196
53	1756	1528	351	718	111	94	247	218
54	261	227	52	107	170	247	253	332
55	1053	916	211	431	324	432	504	633
56	1702	1481	341	696	583	212	895	1140
57	3025	2632	605	1237	340	211	605	665
58	1612	1402	322	659	359	166	577	703
59	2258	1964	452	923	430	256	700	841
60	161	140	32	66	196	407	284	384
61	2103	1830	421	860	236	49	410	462
62	825	718	165	337	18	0	61	35
63	260	226	52	106	5	0	19	10
64	1284	1117	257	525	561	1110	850	1097
65	1339	1165	268	548	65	27	153	128
66	997	867	199	407	210	561	345	410
67	1171	1019	234	479	332	1173	528	649
68	3251	2828	650	1329	2960	1319	4296	5792
69	603	525	121	247	1334	808	1899	2610
70	0	0	0	0	1019	2019	1434	1994
71	1833	1595	367	750	166	175	316	325
72	724	630	145	296	493	268	728	964
73	579	504	116	237	1010	398	1451	1976
74	355	309	71	145	2458	1675	3475	4809
75	1831	1593	366	749	265	137	450	519
76	2313	2012	463	946	232	97	432	453
77	1470	1279	294	601	85	101	179	166
78	1704	1482	341	697	205	47	350	401
79	3987	3469	798	1630	73	27	244	144
80	1948	1695	390	797	581	344	890	1137
81	1521	1323	304	622	172	94	299	336
82	877	763	175	359	57	25	117	112
83	1627	1415	325	665	571	349	874	1118
84	958	833	192	392	70	90	141	137
85	0	0	0	0	83	290	117	163
86	7233	6293	1447	2958	822	1737	1468	1608
87	556	484	111	227	48	31	91	93
88	1023	890	205	418	65	29	133	128
89	1792	1559	359	733	64	20	156	125
90	1361	1184	272	556	58	20	138	114
91	1484	1291	297	607	148	92	280	289
157571	137087	31530	64431	41126	31531	64429	80468	

TRIP STATISTICS - 2020

TRIPS PRODUCED BY THE HOUSING UNITS = 157571

INTERNAL OF TOTAL = 87.0% INTERNAL TRIPS = 137087

HBW OF INTERNAL = 23.0% HBW TRIPS = 31530

HBO OF INTERNAL = 47.0% HBO TRIPS = 64431

NHB OF INTERNAL = 30.0% NHB TRIPS = 41126

COMM VEH TRIPS TOTAL = 9433 INTERNAL = 8207

TRIPS PRODUCED BY EXTERNAL STATIONS = 77592

NHB SECONDARY TRIPS = 31134

ROCKINGHAM - HAMLET

TABLE A-5

EMPLOYMENT BY STANDARD INDUSTRIAL CODE 1994

ZONE NO	INDUST	RETAIL	HWY	RET	OFFICE	SERVICE	DU	TOTAL EMP
1	0	0	0	3	0	65	3	
2	0	0	0	0	1	9	1	
3	8	5	0	0	2	129	15	
4	6	0	3	0	0	130	9	
5	0	1	0	1	0	40	2	
6	5	0	0	0	0	103	5	
7	32	15	0	0	0	85	47	
8	31	9	21	1	12	70	74	
9	0	64	0	10	19	108	93	
10	0	0	0	48	5	145	53	
11	15	96	6	88	121	25	326	
12	11	49	11	24	30	117	125	
13	0	2	10	0	78	319	90	
14	0	1	1	3	0	232	5	
15	0	0	0	0	0	166	0	
16	0	2	101	50	8	123	161	
17	0	0	0	0	109	285	109	
18	0	0	10	0	29	167	39	
19	0	0	0	0	0	248	0	
20	0	6	0	0	3	159	9	
21	0	7	0	0	4	164	11	
22	0	0	0	0	0	20	0	
23	366	2	0	0	0	104	368	
24	0	17	0	0	0	38	17	
25	0	100	8	0	160	118	268	
26	33	22	54	0	13	155	122	
27	0	5	1	0	0	156	6	
28	0	0	0	0	65	168	65	
29	0	0	0	0	1	227	1	
30	30	11	6	0	10	204	57	
31	0	3	2	0	0	32	5	
32	0	93	8	2	305	107	408	
33	0	0	0	0	1	89	1	
34	0	0	0	0	21	109	21	
35	698	25	0	0	13	122	736	
36	0	3	4	90	4	222	101	
37	0	0	0	1	0	50	1	
38	27	3	0	0	4	72	34	
39	22	929	522	94	164	563	1731	
40	0	0	0	0	214	198	214	
41	6	1	3	0	38	307	48	
42	356	6	0	0	0	89	362	
43	0	4	0	0	36	199	40	
44	3	1	0	0	22	169	26	
45	20	10	33	10	27	534	100	
46	0	0	0	0	0	285	0	

ROCKINGHAM - HAMLET

TABLE A-5

EMPLOYMENT BY STANDARD INDUSTRIAL CODE 1994

ZONE NO	INDUST	RETAIL	HWY	RET	OFFICE	SERVICE	DU	TOTAL EMP
47	0	2	0	0	0	0	107	2
48	0	0	0	0	0	2	287	2
49	2	12	17	0	9	164	40	
50	0	10	0	71	21	224	102	
51	164	11	0	0	0	140	175	
52	1652	25	14	0	64	121	1755	
53	16	0	2	0	2	225	20	
54	48	11	0	0	15	32	74	
55	97	62	0	10	7	122	176	
56	0	2	5	0	5	127	12	
57	7	48	0	0	52	325	107	
58	19	4	20	0	18	174	61	
59	0	9	0	0	28	241	37	
60	169	0	0	0	34	9	203	
61	0	0	4	0	0	152	4	
62	0	0	0	0	0	85	0	
63	0	0	0	0	0	18	0	
64	515	0	7	6	80	152	608	
65	0	3	0	0	2	149	5	
66	279	5	0	10	9	120	303	
67	545	0	2	0	0	152	547	
68	2	279	223	82	115	306	701	
69	0	29	11	1	677	46	718	
70	875	30	2	16	169	0	1092	
71	55	2	0	3	28	180	88	
72	4	25	16	11	61	81	117	
73	0	42	88	40	41	66	211	
74	49	124	50	425	272	27	920	
75	0	0	5	24	36	190	65	
76	0	1	5	1	38	271	45	
77	35	2	0	0	10	145	47	
78	0	2	14	0	0	151	16	
79	5	0	0	0	0	255	5	
80	0	0	0	6	175	180	181	
81	0	0	0	8	34	142	42	
82	0	0	0	0	4	84	4	
83	0	39	4	0	46	112	89	
84	37	0	3	0	0	102	40	
85	125	0	0	0	4	0	129	
86	765	18	4	26	48	689	861	
87	0	7	0	0	0	50	7	
88	0	0	0	0	6	72	6	
89	0	0	0	0	1	166	1	
90	0	0	0	0	1	112	1	
91	0	38	0	0	2	183	40	
7134	2334	1300	1165	3635	13962	15568		

ROCKINGHAM - HAMLET

TABLE A-5b

EMPLOYMENT BY STANDARD INDUSTRIAL CODE 2020

ZONE NO	INDUST	RETAIL	HWY	RET	OFFICE	SERVICE	DU	TOTAL EMP
1	0	0	0	0	8	0	119	8
2	0	0	0	0	0	6	27	6
3	13	8	0	0	0	3	164	24
4	12	0	6	0	0	0	165	18
5	0	4	0	4	0	0	58	8
6	14	0	0	0	0	0	139	14
7	38	18	0	0	0	0	139	56
8	38	11	26	1	15	89	91	91
9	0	75	0	12	22	144	109	109
10	0	0	0	56	6	181	62	62
11	16	103	6	94	130	61	349	349
12	13	58	13	28	36	153	148	148
13	0	2	11	0	86	373	99	99
14	0	2	2	6	0	286	10	10
15	0	0	0	0	0	220	0	0
16	0	2	115	57	9	159	183	183
17	0	0	0	0	118	322	118	118
18	0	0	12	0	36	203	48	48
19	0	0	0	0	0	302	0	0
20	0	21	0	0	11	195	32	32
21	0	13	0	0	7	200	20	20
22	0	0	0	0	0	40	0	0
23	389	2	0	0	0	158	391	391
24	0	33	0	0	0	59	33	33
25	0	109	9	0	174	154	292	292
26	37	25	61	0	15	191	138	138
27	0	24	5	0	0	192	29	29
28	0	0	0	0	81	204	81	81
29	0	0	0	0	6	281	6	6
30	38	14	8	0	13	258	73	73
31	0	17	11	0	0	50	28	28
32	0	98	8	2	323	126	431	431
33	0	0	0	0	10	108	10	10
34	0	0	0	0	53	181	53	53
35	720	26	0	0	13	158	759	759
36	0	3	4	98	4	276	109	109
37	0	0	0	24	0	70	24	24
38	52	6	0	0	8	145	66	66
39	23	985	554	100	174	685	1836	1836
40	0	0	0	0	246	320	246	246
41	10	2	5	0	63	429	80	80
42	366	6	0	0	0	125	372	372
43	0	5	0	0	45	272	50	50
44	7	2	0	0	49	293	58	58
45	22	11	36	11	30	658	110	110
46	0	0	0	0	0	426	0	0

ROCKINGHAM - HAMLET

TABLE A-5b

EMPLOYMENT BY STANDARD INDUSTRIAL CODE 2020

ZONE NO	INDUST	RETAIL	HWY	RET	OFFICE	SERVICE	DU	TOTAL EMP
47	0	65	0	0	0	231	65	
48	0	0	0	0	65	324	65	
49	5	31	44	0	23	176	103	
50	0	16	0	115	34	236	165	
51	223	15	0	0	0	140	238	
52	1692	26	14	0	66	134	1798	
53	42	0	5	0	5	237	52	
54	89	20	0	0	28	36	137	
55	132	84	0	14	10	127	240	
56	0	20	49	0	49	200	118	
57	8	52	0	0	57	337	117	
58	29	6	30	0	27	187	92	
59	0	35	0	0	107	253	142	
60	188	0	0	0	38	20	226	
61	0	0	27	0	0	205	27	
62	0	0	0	0	0	98	0	
63	0	0	0	0	0	30	0	
64	523	0	7	6	81	164	617	
65	0	9	0	0	6	161	15	
66	288	5	0	10	9	131	312	
67	650	0	2	0	0	164	652	
68	2	292	233	86	120	342	733	
69	0	30	11	1	707	58	749	
70	899	31	2	16	174	0	1122	
71	61	2	0	3	31	217	97	
72	5	32	20	14	78	93	149	
73	0	44	92	42	43	78	221	
74	50	125	51	430	275	39	931	
75	0	0	6	28	42	202	76	
76	0	1	6	1	46	283	54	
77	42	2	0	0	12	157	56	
78	0	3	23	0	0	163	26	
79	15	0	0	0	0	376	15	
80	0	0	0	6	185	191	191	
81	0	0	0	10	42	154	52	
82	0	0	0	0	14	95	14	
83	0	85	9	0	100	185	194	
84	46	0	4	0	0	114	50	
85	156	0	0	0	5	0	161	
86	858	20	4	29	54	834	965	
87	0	17	0	0	0	62	17	
88	0	0	0	0	16	109	16	
89	0	0	0	0	11	178	11	
90	0	0	0	0	11	150	11	
91	0	48	0	0	3	194	51	
7811	2801	1531	1312	4366	17423	17821		



APPENDIX B



APPENDIX B

GOALS & OBJECTIVES SURVEY DATA SUMMARY FOR ROCKINGHAM AND HAMLET

SURVEY FORM:

A two page survey was distributed to travellers in the planning area to determine local desires and priorities for the thoroughfare plan. The survey was made available to City Council Members, local staff, as well as the public. The survey form was organized as follows:

Page 1: Twenty issues were scored from very undesirable (-2) to very desirable (+2) in the categories of Environment, Neighborhood, Economic, and Transportation.

Page 2: Five issues in each of five categories were ranked in order of importance (from 1-5, 1 being most important).

SUMMARY PROCEDURE:

The scores for each issue on page 1 were combined from all surveys to get totals (subtract negatives, add positives). These values were used in bar graph defining the priority of each issue.

For page 2, the number of times each issue received a #1 ranking was determined. These numbers were used in a bar graph to demonstrate which issues were most frequently ranked first.

INTRODUCTION:

A significant element in the thoroughfare planning process is public participation. The development of a transportation plan requires active public participation to assure that the objectives outlined in the plan reflect the values of the community. If a plan for a community is not related to the values of the community, then it is likely that the plan will not be implemented.

A technique commonly used in transportation planning to determine community values is a goals and objectives survey. This survey attempts to identify how a community perceives transportation related issues. Many of the questions require the participant to make trade-offs to solve transportation problems, as well as setting up a framework for the types of trade-offs the community is willing to accept.

CONCLUSIONS:

Based on the responses recorded on page 1 of this survey, the goals that reflect the highest priority are preservation of neighborhood/community, increased traffic safety, and avoiding urbanization and strip development. Other goals viewed as important include improving travel safety for pedestrians/bicyclists and encouraging economic vitality.

On page 2 the highest frequency of #1 rankings occurred in issues stating the desire to attract new industry and to stimulate new economic development growth.

With regard to local project needs, there exists an overwhelming support for the US 74 Bypass. On the other hand, very little support was recorded for widening US 220 to a multilane facility.

ROCKINGHAM AND HAMLET TRANSPORTATION STUDY PUBLIC OPINION SURVEY

We need your input. Please circle the number to indicate how desirable the following items are to you.

Very Undesirable ---	-2
Undesirable -----	-1
Neutral -----	N
Desirable -----	+1
Very Desirable -----	+2

ENVIRONMENTAL ISSUES:

1) Minimize air pollution from vehicles:	-2	-1	N	+1	+2
2) Minimize traffic noise in neighborhoods:	-2	-1	N	+1	+2
3) Minimize traffic noise in business areas:	-2	-1	N	+1	+2
4) Urbanize all undeveloped land:	-2	-1	N	+1	+2
5) Protect natural areas as buffer zones:	-2	-1	N	+1	+2

NEIGHBORHOOD ISSUES:

1) Preserve historic property:	-2	-1	N	+1	+2
2) Protect neighborhoods from truck traffic:	-2	-1	N	+1	+2
3) Landscape streets with trees and shrubs:	-2	-1	N	+1	+2
4) Preserve community character:	-2	-1	N	+1	+2
5) Travel safety for pedestrians & bicyclists:	-2	-1	N	+1	+2

ECONOMIC ISSUES:

1) Minimize road construction costs:	-2	-1	N	+1	+2
2) Minimize travel time and cost:	-2	-1	N	+1	+2
3) Provide better access to Central Business District:	-2	-1	N	+1	+2
4) Invite long sections of urban strip development:	-2	-1	N	+1	+2
5) Encourage economic vitality:	-2	-1	N	+1	+2

TRANSPORTATION ISSUES:

1) Have frequent traffic signals on major roads:	-2	-1	N	+1	+2
2) Increase traffic safety:	-2	-1	N	+1	+2
3) Provide bicycle paths to schools and parks:	-2	-1	N	+1	+2
4) Provide vans to shopping areas and downtown to relieve some of the parking demand:	-2	-1	N	+1	+2
5) Provide sidewalks and scenic paths to encourage people to walk instead of drive:	-2	-1	N	+1	+2

**** Please circle your residence (Rockingham or Hamlet), & return completed survey forms to:**

	Rockingham Planning Department
	311 E. Franklin Street, Rockingham, N.C. 28379
or	Hamlet Planning Department
	201 Main Street, Hamlet, N.C. 28345

ROCKINGHAM AND HAMLET PUBLIC OPINION SURVEY

Please rank each group of items in order of importance.
(1 is the most important, 5 is the least important)

RANK HOW ROAD CAPACITY SHOULD BE INCREASED:

- _____ By improving the geometric design of intersections:
- _____ By constructing additional traffic lanes:
- _____ By controlling strip development and promoting rural growth:
- _____ By encouraging people to ride together or ride public transportation:
- _____ By providing alternative modes of travel such as pedestrian paths or bicycle trails:

RANK WHY ROADS SHOULD BE PLANNED:

- _____ To urbanize the rural land outside the town limits:
- _____ To increase the tax base:
- _____ To control growth:
- _____ To revitalize the existing developed areas (such as renovating historic buildings):
- _____ To limit land acquisition cost for future projects:

RANK THE LOCAL ISSUES:

- _____ Minimize road widening and construction costs:
- _____ Improve Transit System:
- _____ Minimize the environmental impacts of building new roads:
- _____ Attract new industry:
- _____ Improve parking in central business district:

RANK THE ISSUES IN DEVELOPING A THOROUGHFARE PLAN:

- _____ Environmental preservation:
- _____ Individual home or business preservation:
- _____ Community preservation:
- _____ New economic development growth:
- _____ Community enhancements (such as better roads, quieter neighborhoods, pedestrian trails...):

RANK LOCAL PROJECT NEEDS:

- _____ Widen US 1 to a multi-lane facility with a bypass of Rockingham on new location:
- _____ US 74 Bypass of Rockingham and Hamlet on new location:
- _____ Improve access to US 220, US 1, and NC 177 by constructing a loop system to the north of Rockingham and Hamlet:
- _____ Widen US 220 to a multi-lane facility from proposed US 74 Bypass to Forrest Street:
- _____ Widen US 1 to a multi-lane facility from NC 177 to existing four lanes at Moore County:

***** Feel free to attach additional comments to survey. *****

ISSUE**SCORE****ENVIRONMENTAL**

1) Minimize air pollution	47
2) Minimize traffic noise in neighborhoods	44
3) Minimize traffic noise in business areas	18
4) Urbanize all undeveloped land	-30
5) Protect natural areas	43

NEIGHBORHOOD

1) Preserve historic property	64
2) Protect neighborhoods from truck traffic	64
3) Landscape streets with trees and shrubs	36
4) Preserve community character	61
5) Travel safety for pedestrians and bicyclists	58

ECONOMIC

1) Minimize road construction costs	37
2) Minimize travel time and cost	42
3) Provide better access to CBD	36
4) Invite long sections of urban strip development	1
5) Encourage economic vitality	56

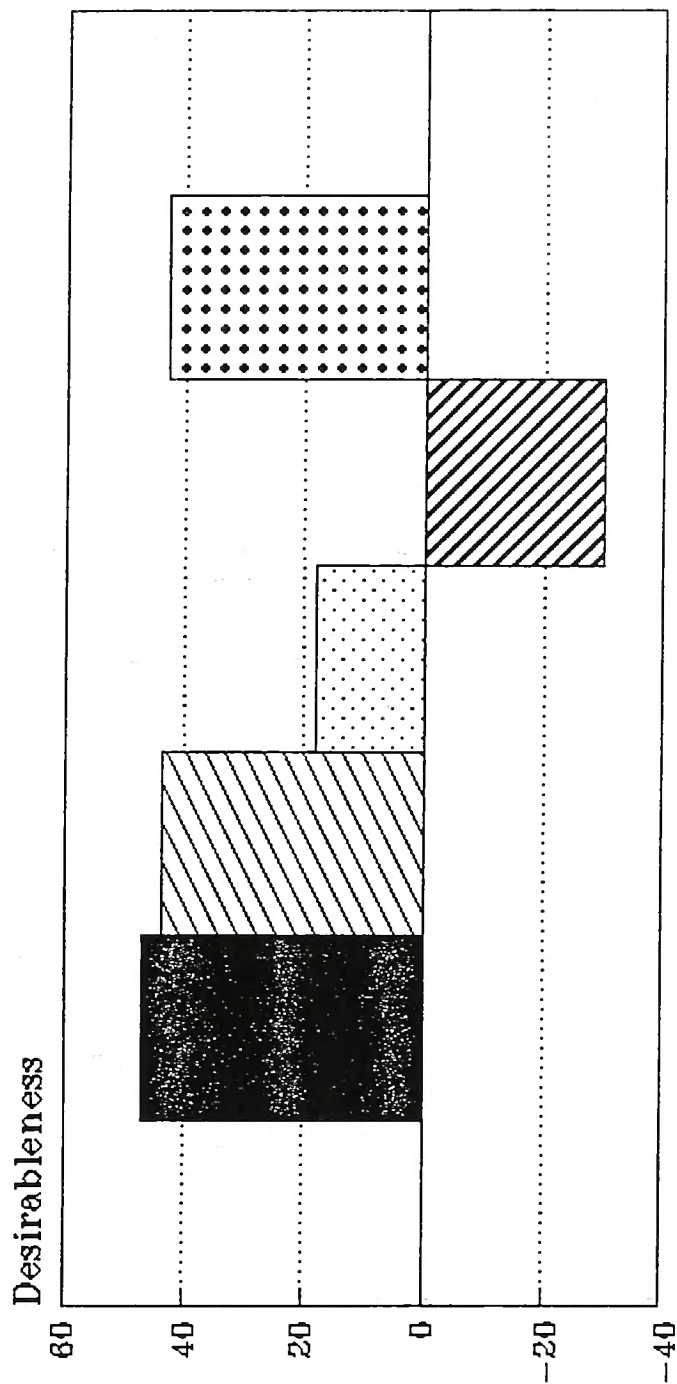
TRANSPORTATION

1) Frequent traffic signals on major roads	11
2) Increase traffic safety	70
3) Provide bicycle paths to schools and parks	51
4) Provide vans to shopping areas and downtown	11
5) Provide sidewalks and scenic paths	46

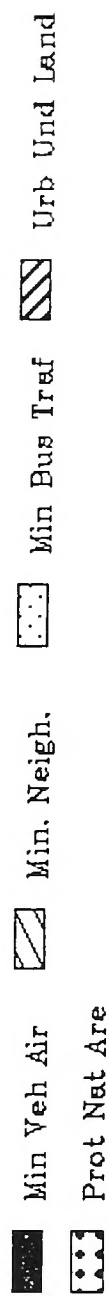
ISSUE/METHOD	FREQUENCY OF #1 RANKINGS
HOW ROAD CAPACITY SHOULD BE INCREASED	
1) Improve the geometric design of intersections:	12
2) Construct additional traffic lanes:	17
3) Control strip development:	6
4) Encourage ride-sharing:	9
5) Provide alternative travel modes:	10
WHY ROADS SHOULD BE PLANNED	
1) Urbanize rural land	10
2) Increase tax base:	6
3) Control growth patterns to predetermined areas:	16
4) Revitalize existing developed areas:	10
5) To limit land acquisition cost for future projects:	7
LOCAL ISSUES	
1) Minimize road widening and construction costs:	7
2) Improve Transit System:	7
3) Minimize the environmental impacts:	11
4) Attract new industry:	35
5) Improve parking in CBD:	8
ISSUES IN DEVELOPING A THOROUGHFARE PLAN	
1) Environmental preservation:	12
2) Individual home or business preservation:	13
3) Community preservation:	14
4) New economic development growth:	21
5) Community enhancements:	15
LOCAL PROJECT NEEDS	
1) Widen US 1 to a multi-lane facility with a bypass of Rockingham on new location:	12
2) US 74 Bypass of Rockingham and Hamlet on new location:	29
3) Improve access to US 220, US 1, and NC 177 by constructing a loop system to the north of Rockingham and Hamlet:	8
4) Widen US 220 to a multi-lane facility from proposed US 74 Bypass to Forrest Street:	7
5) Widen US 1 to a multi-lane facility from NC 177 to existing four lanes at Moore County:	17

ROCKINGHAM/HAMLET

Public Opinion Survey

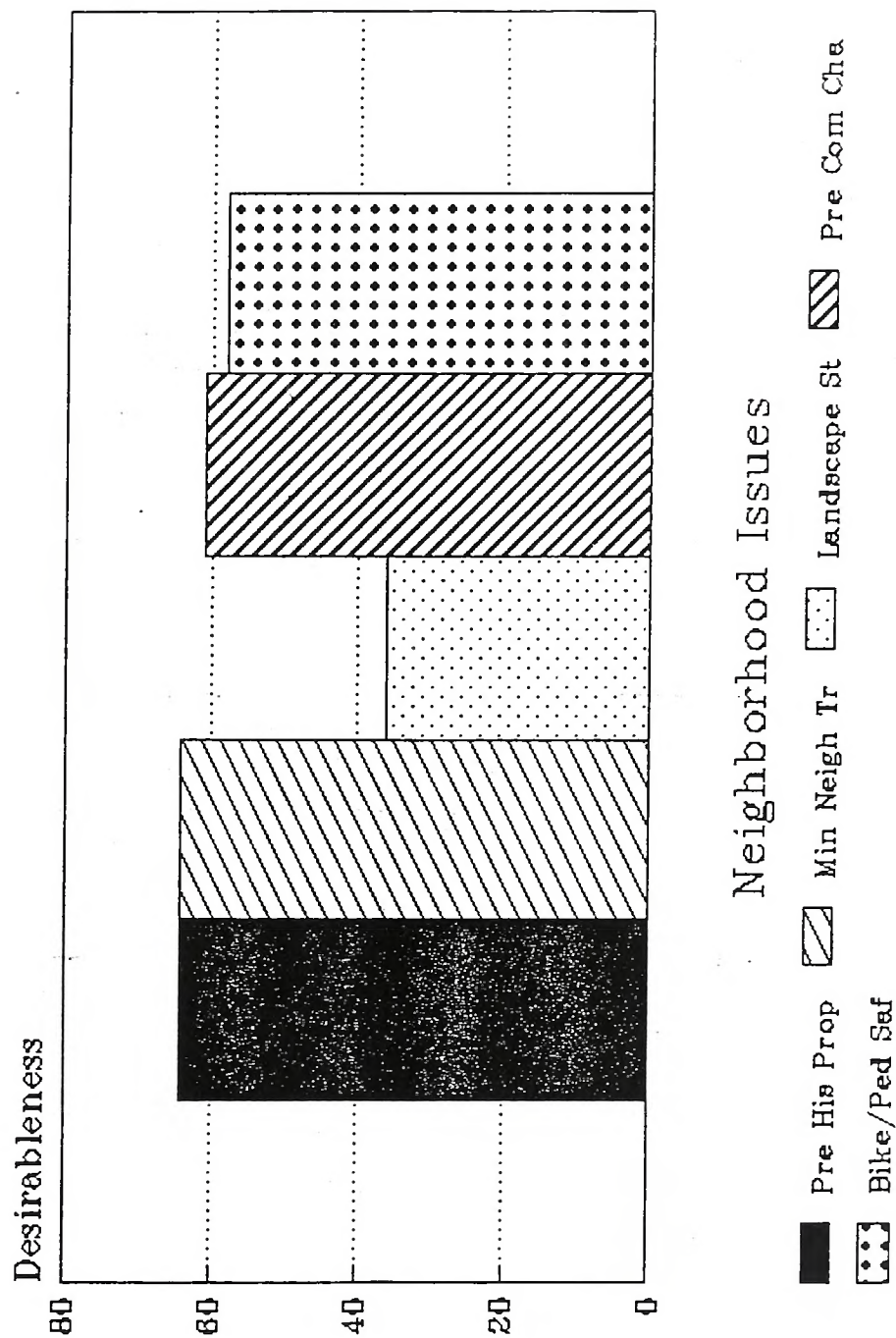


Environmental Issues



ROCKINGHAM/HAMLET

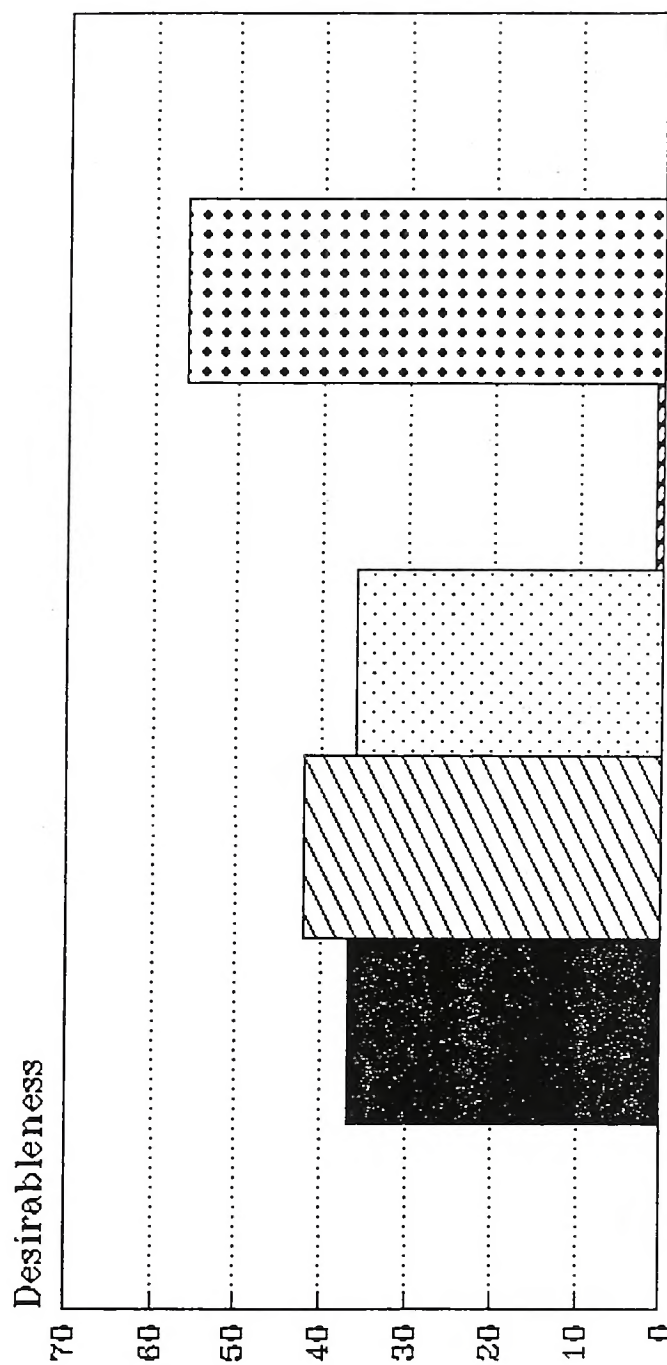
Public Opinion Survey



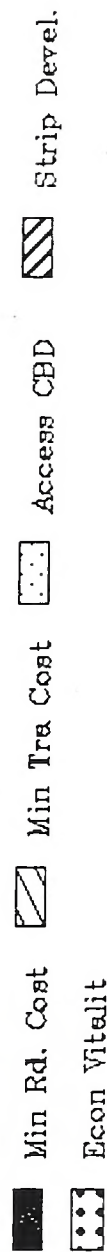


ROCKINGHAM/HAMLET

Public Opinion Survey



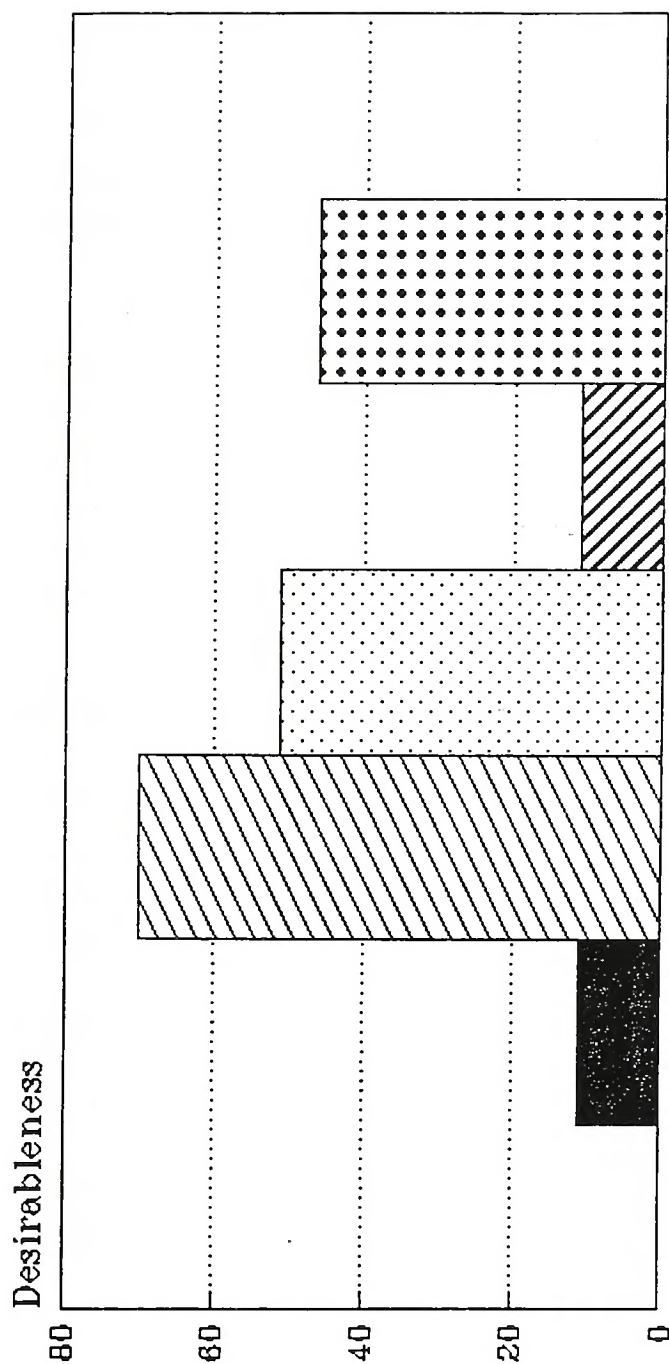
Economic Issues










ROCKINGHAM/HAMLET

Public Opinion Survey



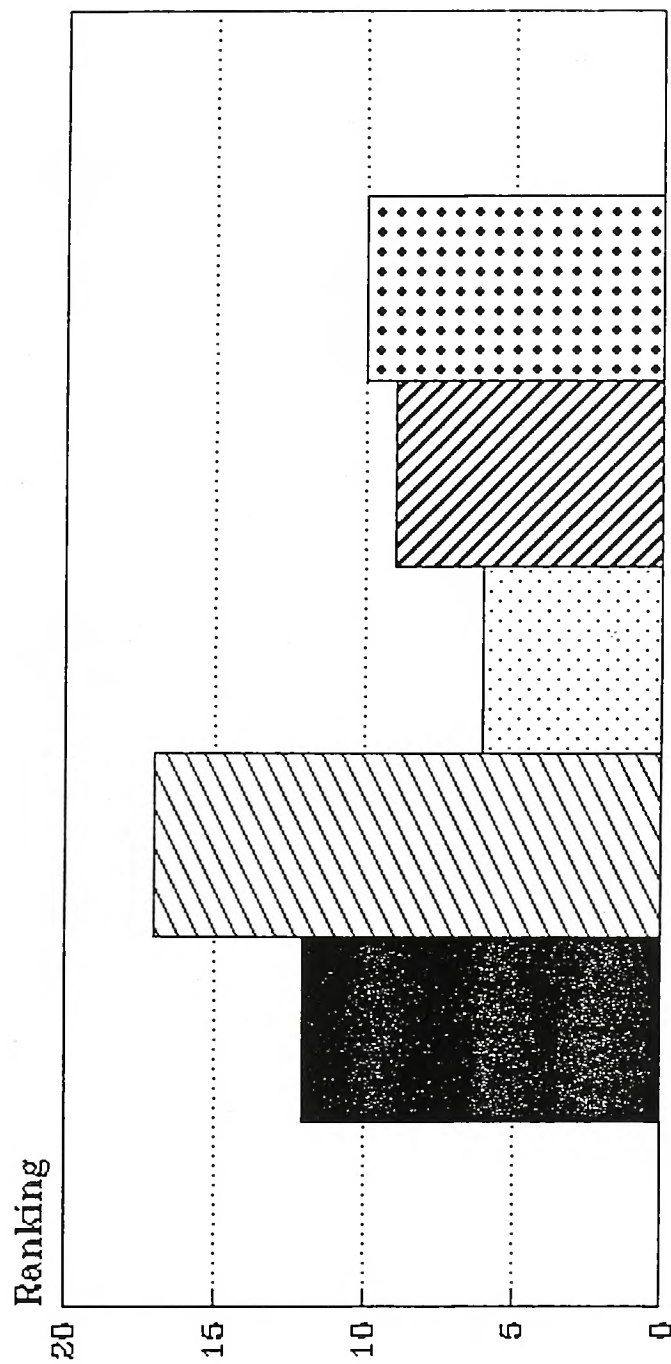
Transportation Issues

-  Traf Signals
-  Traf Safety
-  Bike Paths
-  Provide Vans
-  Pro Sidewalk








ROCKINGHAM/HAMLET

Public Opinion Survey



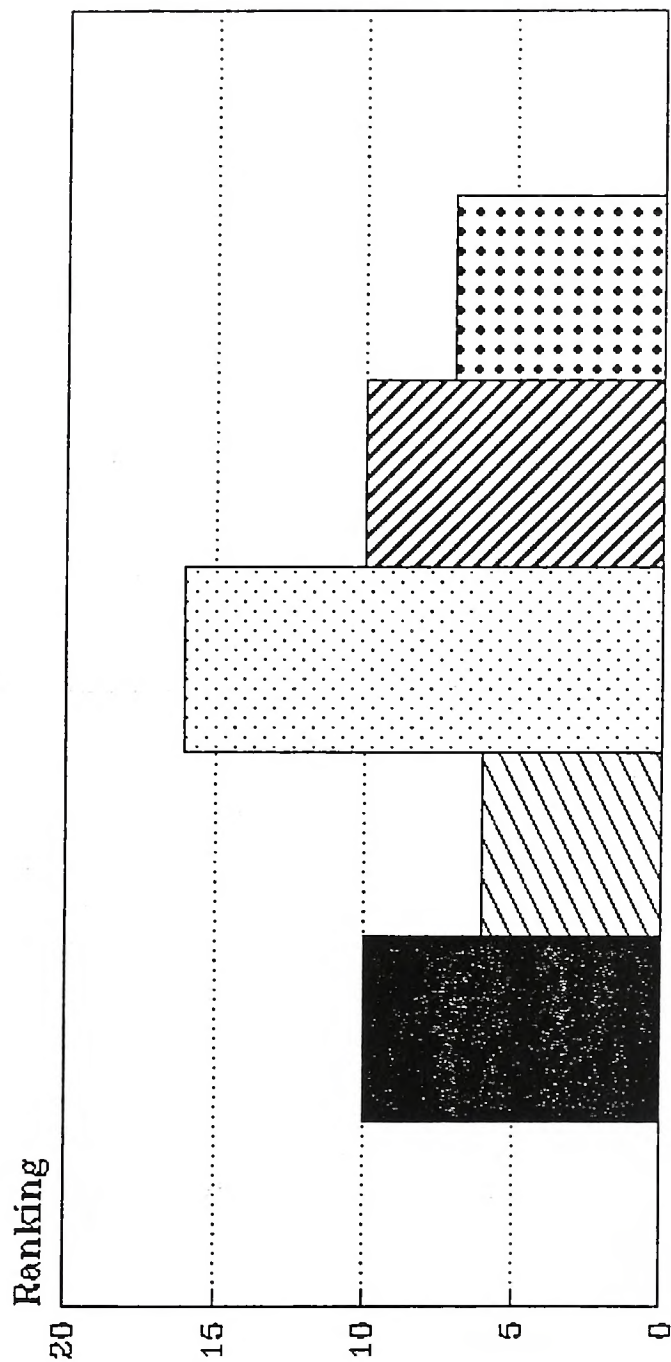
How Road Capacity Should Be Increased

- Improv Ints. 
- Add Traf Lan 
- No Strip Dev 
- Ride-Share 
- Alter. Modes 

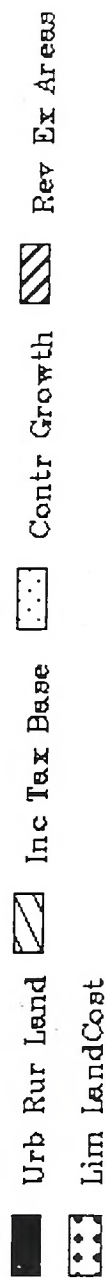


ROCKINGHAM/HAMLET

Public Opinion Survey



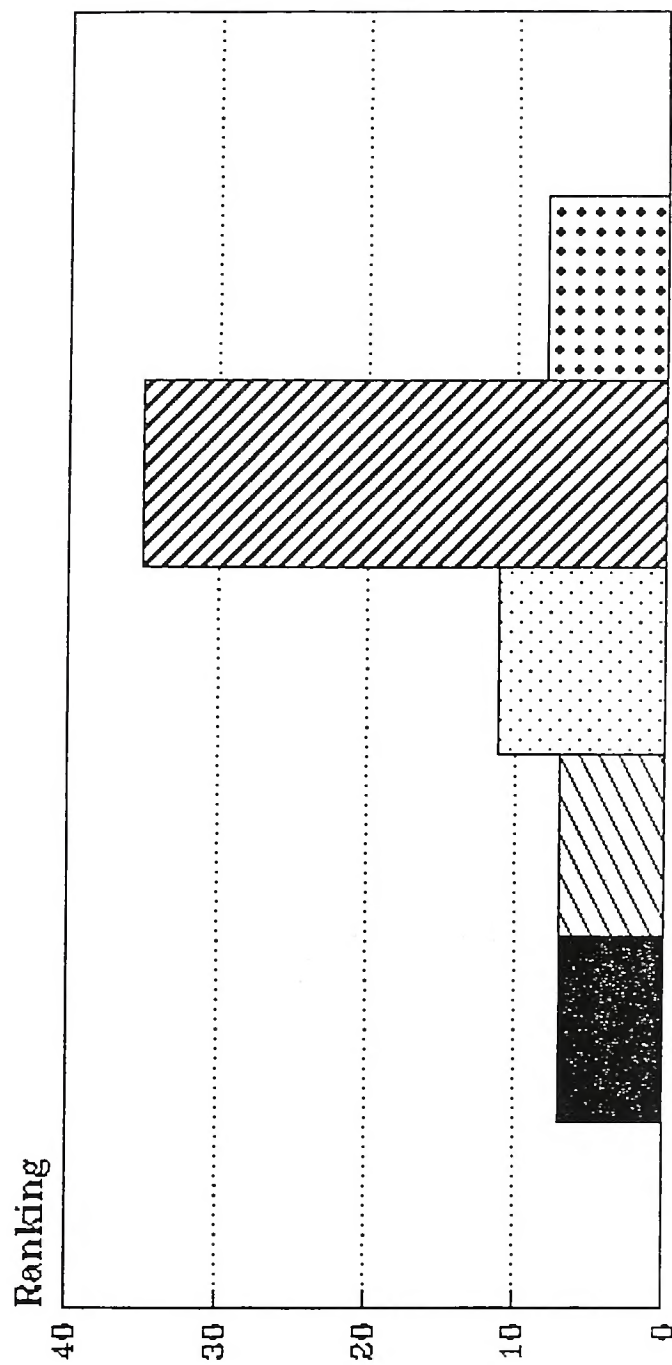
Why Roads Should Be Planned





ROCKINGHAM/HAMLET

Public Opinion Survey

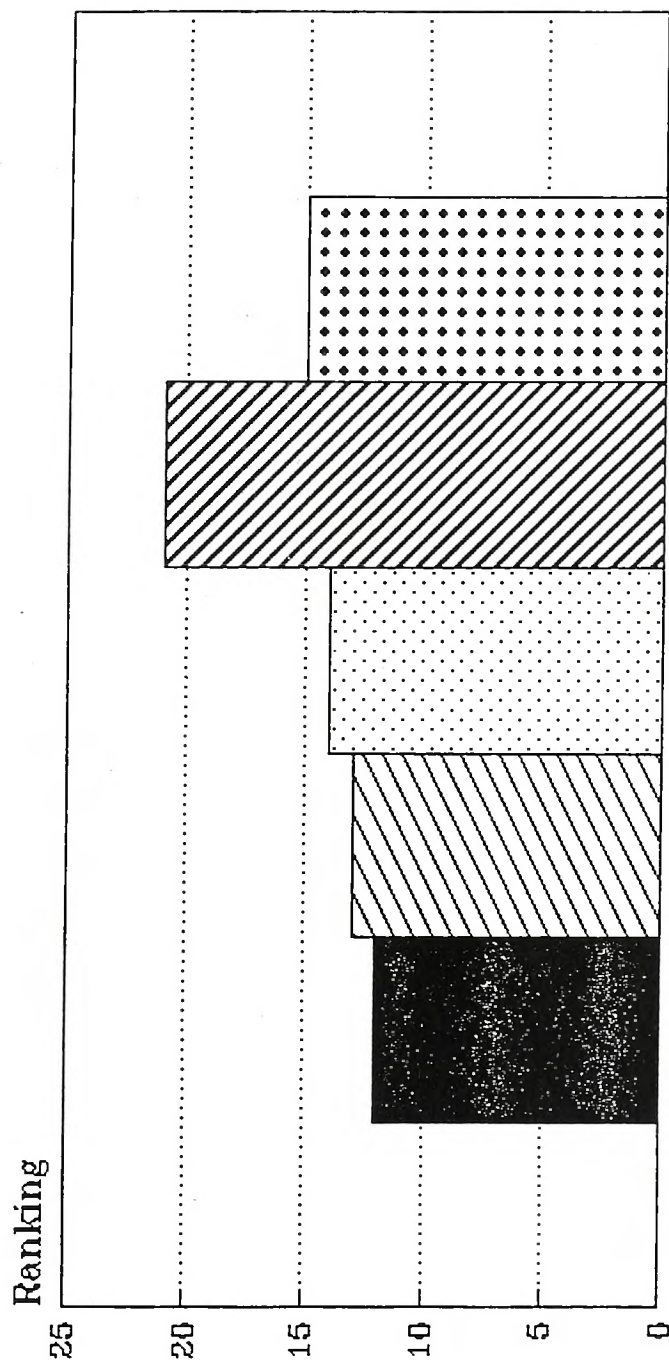


The Local Issues

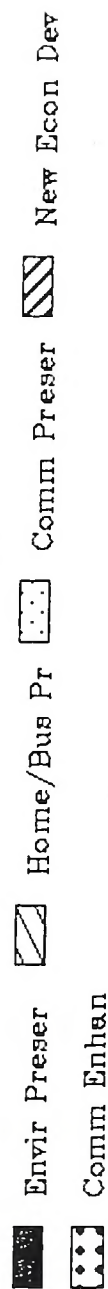
- Min Road Wid
- Impr Parking
- Impr Transit
- Min Env Impa
- Att New Ind.

ROCKINGHAM/HAMLET

Public Opinion Survey



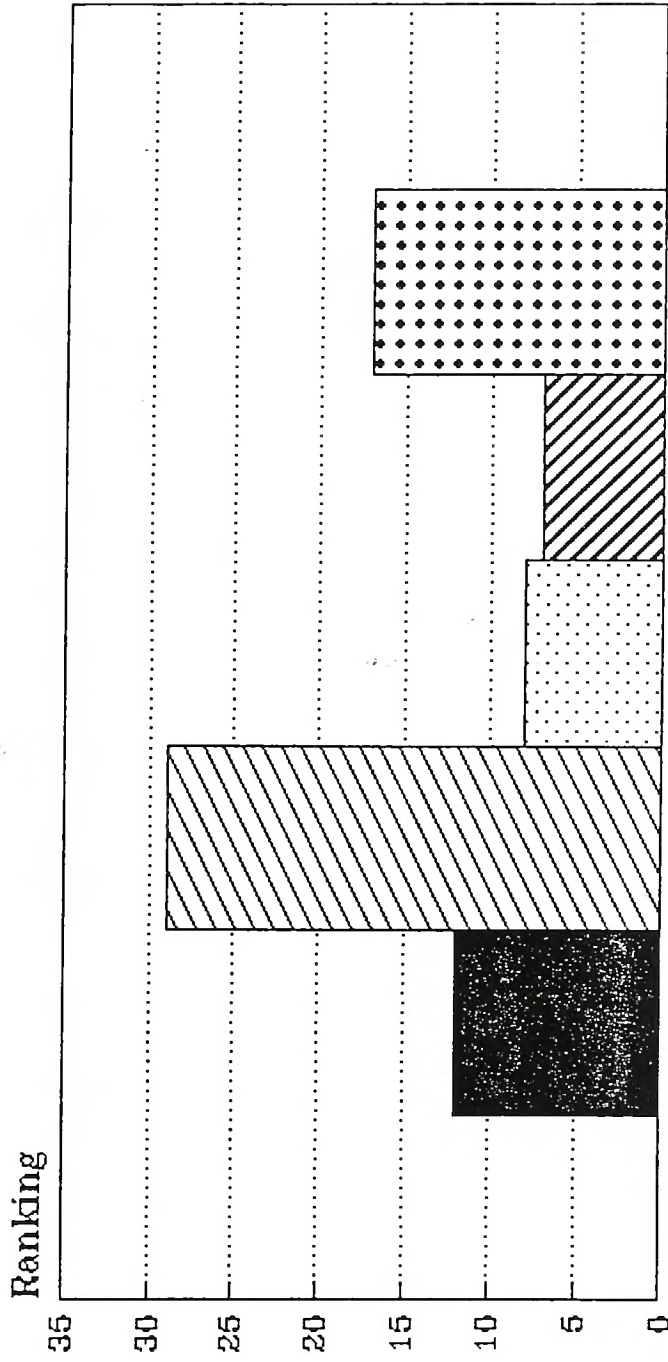
The Issues In Developing A Thoroughfare










ROCKINGHAM/HAMLET

Public Opinion Survey



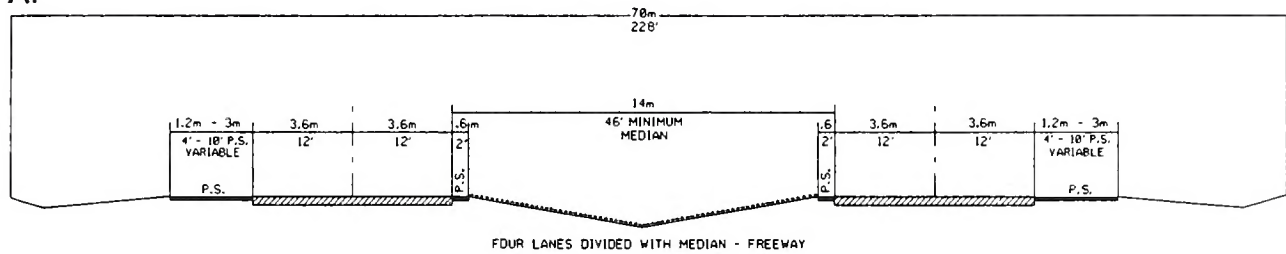
Local Project Needs

-  US 1 Bypass
-  US 74 Bypass
-  North. Loop
-  Widen US 220
-  Widen US 1

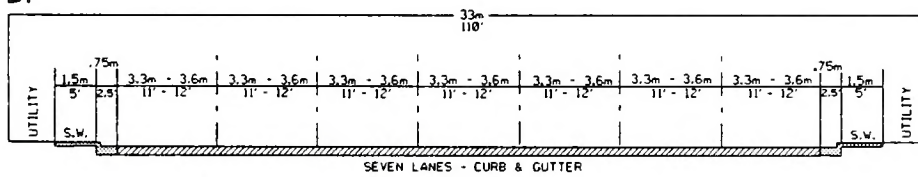
APPENDIX C

TYPICAL THOROUGHFARE CROSS SECTIONS

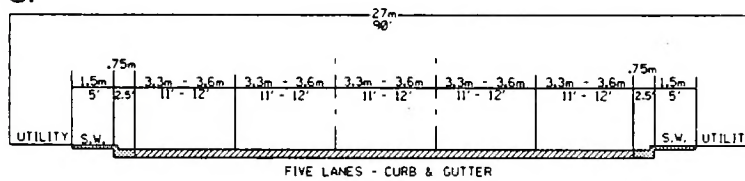
A.



B.



C.



D.

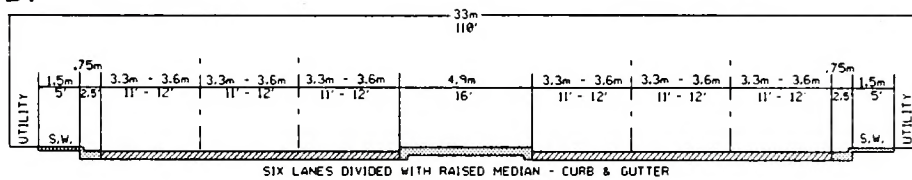
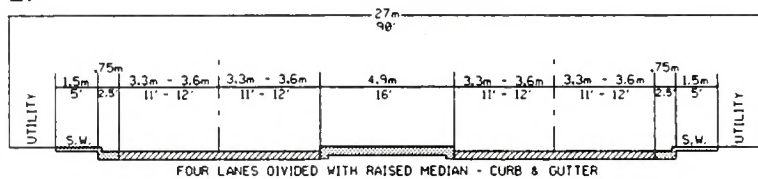


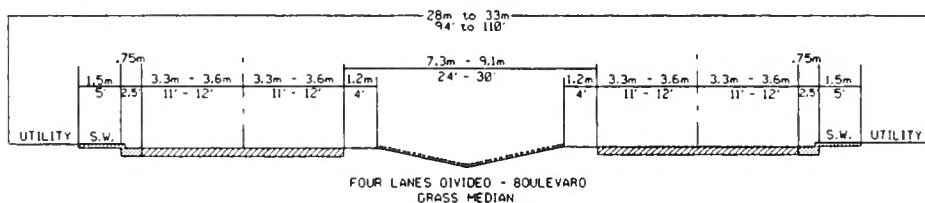
Figure 10

TYPICAL THOROUGHFARE CROSS SECTIONS

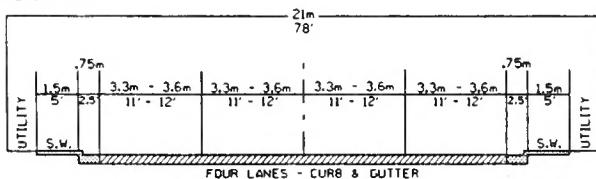
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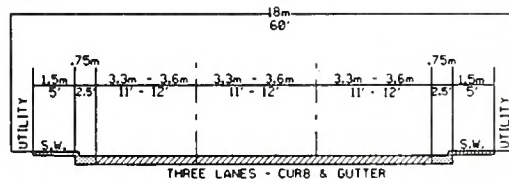
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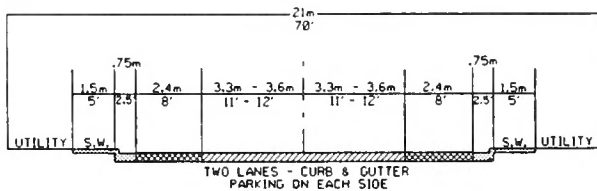
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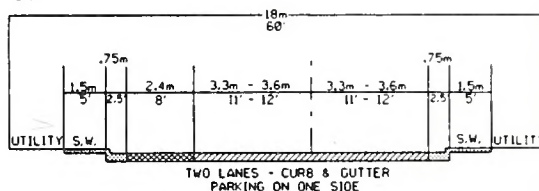
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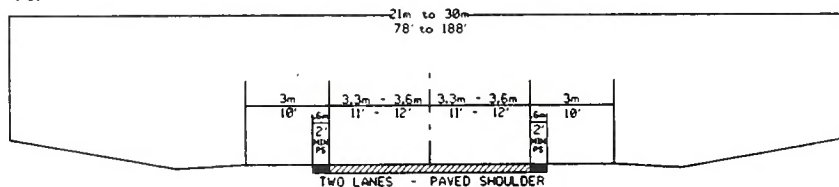
I.



J.

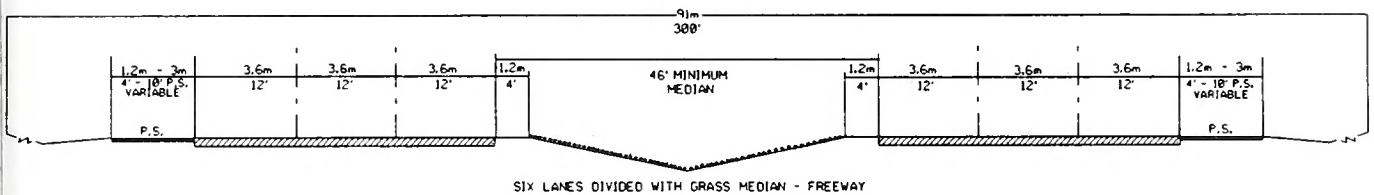


K.

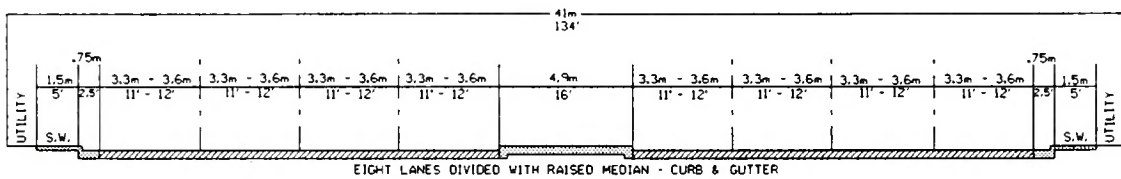


TYPICAL THOROUGHFARE CROSS SECTIONS

L.

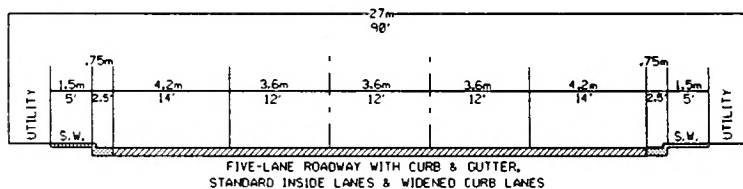


M.

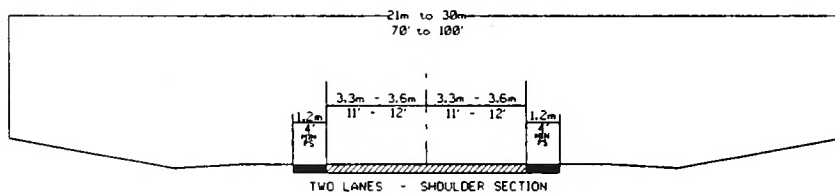


TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

N.



O.



P.

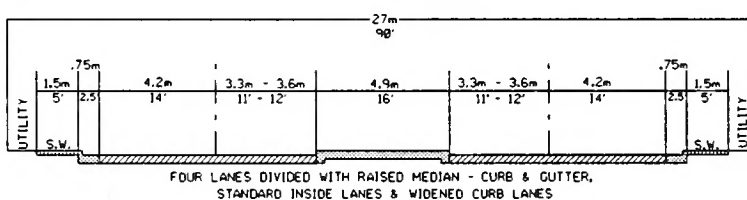


TABLE C2

MAJOR THOROUGHFARES FACILITY & SECTION	EXISTING X- SECTION			CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	DIST mi	RDWY ft	ROW ft				RDWAY (ULT)	ROW (ULT)
US 1								
PLANNING BOUNDARY - 2.30 mi N PL BOUND	2.30	23	100	10000	3000	5700	TIP R-2501	TIP
2.30 mi N PL BOUND - SR 1187	2.06	23	60	10000	2500	3900	ADQ	ADQ
SR 1187 - US 220	1.04	23	60	10000	9000	15000	TIP R-2501	TIP
US 220 - SCL ROCKINGHAM	.48	23	60	10000	5200	9000	ADQ	ADQ
SCL ROCKINGHAM - US 74	.66	68	60	39400	5200	9000	ADQ	ADQ
US 74 - US 1 NBL	.18	40	60	16000	5500	12000	ADQ	ADQ
US 1 NBL - SR 1648 (Rock Hm Rd)	.20	38	60	14000	6500	10100	ADQ	ADQ
SR 1648 - US 1 SBL	.06	28	60	14000	6500	10100	ADQ	ADQ
US 1 NBL -WASHINGTON	.30	30	60	14000	5400	9200	ADQ	ADQ
US 1 SBL - STEWART ST	.58	30	60	11500	11300	21000	TIP R-2501	TIP
STEWART ST - LONG DRIVE	.31	34	60	11500	11300	21000	TIP R-2501	TIP
LONG DRIVE - 0.80 mi E LONG DRIVE	.80	48	60	22000	9300	20000	TIP R-2501	TIP
0.80 mi E LONG DR - URBAN BOUNDARY	1.20	25	60	12000 (35000)	9300	20000	TIP U-3456	TIP
URBAN BOUNDARY - 0.26 mi E URB BDRY	.26	39	60	9500	6700	12700	TIP U-3456	TIP
0.26 mi E URB BDRY - 0.58 mi E URB BDRY	.32	35	70	9500	6700	12700	TIP R-2501	TIP
0.58 mi E URB BDRY - PLANNING BOUNDARY	1.25	24	60	11500	5000	9600	TIP R-2501	TIP
ROW - RIGHT OF WAY ADT - AVERAGE DAILY TRAFFIC TP - THOROUGHFARE PLAN PROJECT ADQ - ADEQUATE TIP - TRANSPORTATION IMPROVEMENT PROGRAM PROJECT								

TABLE C2 cont'd

MAJOR THOROUGHFARES FACILITY & SECTION	EXISTING X- SECTION			CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	DIST mi	RDWY ft	ROW ft				RDWAY (ULT)	ROW (ULT)
US 74								
ANSON CO LINE - URBAN BOUNDARY	4.22	32	200	41700	11600	23800	ADQ	ADQ
URBAN BOUNDARY - 0.68 mi E URB BDRY	.68	48	200	40000	12600	25700	TIP R-512	TIP
0.68 mi E URB BDRY - US 220	1.12	66	80	33000	19000	30000	TIP R-512	TIP
LEE ST - US 1	.37	48	100	20000	20000	42000	TIP R-512	TIP
US 1 - 1.51 mi E US 1	1.51	60	150	40000	25400	42000	TIP R-512	TIP
1.51 mi E US 1 - 1.94 mi E US 1	.43	85	150	40000	22500	42600	TIP R-512	TIP
1.94 mi E US 1 - 2.02 mi E US 1	.08	60	150	40000	22500	42600	TIP R-512	TIP
2.02 mi E US 1 - 2.26 mi E US 1	.24	46	150	40000	22500	42600	TIP R-512	TIP
2.26 mi E US 1 - URBAN BOUNDARY	.79	44	70	40000	22500	42600	TIP R-512	TIP
URBAN BOUNDARY - 1.79 mi E URB BDRY	1.79	46	70	40000	22500	42600	TIP R-512	TIP
1.79 mi E URB BDRY - 1.91 mi E URB BDRY	.12	52	150	11500	18100	34000	TIP R-512	TIP
1.91 mi E URB BDRY - NC 177	.20	40	70	11500	18100	34000	TIP R-512	TIP
NC 177 - SR 1811	.52	46	70	11500	14000	24500	TIP R-512	TIP
SR 1811 - NC 38	.46	44	60	20000	18000	40000	TIP R-512	TIP
ROW - RIGHT OF WAY ADT - AVERAGE DAILY TRAFFIC TP - THOROUGHFARE PLAN PROJECT ADQ - ADEQUATE TIP - TRANSPORTATION IMPROVEMENT PROGRAM PROJECT								

TABLE C2 cont'd

MAJOR THOROUGHFARES FACILITY & SECTION	EXISTING X- SECTION			CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	DIST mi	RDWY ft	ROW ft				RDWAY (ULT)	ROW (ULT)
US 74								
NC 38 - SCL HAMLET	.48	46	60	22000	18000	40000	TIP R-512	TIP
SCL HAMLET - NC 381	.66	55	60	22000	15800	33600	TIP R-512	TIP
NC 381 - PLANNING BOUNDARY	2.25	48	160	40000	13000	28000	TIP R-512	TIP
US 220								
SCL ROCKINGHAM - 0.87 mi N SCL RKHM	.87	48	180	40000	2800	7000	TIP R-3421	TIP
0.87 mi N SCL RKHM - US 74	.08	86	200	40000	6500	11400	TIP R-3421	TIP
US 74 - 0.49 mi N US 74	.49	68	200	40000	11300	23000	TIP R-3421	TIP
0.49 mi N US 74 - NORTHSIDE DR	3.61	48	200	40000	11100	24000	TIP R-3421	TIP
NC 38								
SC STATELINE - URBAN BOUNDARY	3.81	20	100	9500	2400	5000	ADQ	ADQ
URBAN BDRY - 0.34 mi N URB BDRY	.34	22	100	9500	3400	5700	ADQ	ADQ
0.34 mi N URB BDRY - SR 1615	1.10	20	60	9500	3400	5700	ADQ	ADQ
SR 1615 - US 74	.25	44	60	9500	2700	5000	ADQ	ADQ
NC 177								
PLANNING BOUNDARY - SR 1990	.75	22	60	9500	1500	2900	ADQ	ADQ
SR 1990 - 3.70 mi N SR 1990	3.70	22	60	11500	3100	5500	ADQ	ADQ
3.70 mi N SR 1990 - 4.25 mi N SR 1990	.55	25	60	11500	4000	8000	ADQ	ADQ
ROW - RIGHT OF WAY ADT - AVERAGE DAILY TRAFFIC TP - THOROUGHFARE PLAN PROJECT ADQ - ADEQUATE TIP - TRANSPORTATION IMPROVEMENT PROGRAM PROJECT								

TABLE C2 cont'd

MAJOR THOROUGHFARES FACILITY & SECTION	EXISTING X- SECTION			CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	DIST mi	RDWY ft	ROW ft				RDWAY (ULT)	ROW (ULT)
NC 177								
4.25 mi N SR 1990 - US 74	.71	32	60	11500	11400	18000	TP Bypass	TP Bypass
US 74 - CL HAMLET	.51	24	60	11500	8500	15000	TP Bypass	TP Bypass
CL HAMLET - PLANNING BOUNDARY	3.75	24	100	11500	5200	10000	TP Bypass	TP Bypass
NC 381								
PLANNING BOUNDARY - US 74	3.25	20	60	8500	1600	3600	ADQ	ADQ
SR 1900 (BATTLE DAIRY RD)								
PLANNING BOUNDARY - SR 1994	2.15	16	60	8000	1800	3800	ADQ	ADQ
SR 1994 - NC 177	2.97	22	60	11000	1800	3800	ADQ	ADQ
SR 1825 (AIRPORT RD)								
PLANNING BOUNDARY - SR 1811	1.50	18	60	8500	1400	3500	ADQ	ADQ
SR 1811 - NC 177	.70	18	60	8500	1400	3500	ADQ	ADQ
SR 1966 (AIRPORT RD)								
NC 177 - SR 1971	4.50	22	60	11000	6600	11000	TIP R-512	TIP R-512
SR 1971 - US 1	.68	18	60	8500	7000	12000	TIP R-512	TIP R-512
SR 1811 (GIN MILL RD/LACKEY ST)								
SR 1825 - 2.55 mi N SR 1825	2.55	18	60	8500	300	1000	ADQ	ADQ
2.55 mi N SR 1825 - SR 1615	.32	28	60	11000	1100	2000	ADQ	ADQ
SR 1812 (FREEMAN MILL RD)								
NC 38 - SR 1900	3.00	22	60	9500	400	1600	ADQ	ADQ
ROW - RIGHT OF WAY ADT - AVERAGE DAILY TRAFFIC TP - THOROUGHFARE PLAN PROJECT ADQ - ADEQUATE TIP - TRANSPORTATION IMPROVEMENT PROGRAM PROJECT								

TABLE C2 cont'd

MAJOR THOROUGHFARES FACILITY & SECTION	EXISTING X- SECTION			CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	DIST mi	RDWY ft	ROW ft				RDWAY (ULT)	ROW (ULT)
SR 1914 (FREEMAN MILL RD) SR 1900 - SR 1915	1.47	22	60	11500	2200	4100	ADQ	ADQ
SR 1833 (PERRY WILLIAMS RD) 0.25 mi W SR 1806 - NC 38	1.33	20	60	10500	700	1500	ADQ	ADQ
SR 1615 (MAIN ST/ GIBSON SMITH RD) NC 177 - 0.37 mi E NC 177	.37	30	60	12000	4000	8500	ADQ	ADQ
0.37 mi E NC 177 - SR 1811	.24	60	60	16000	4000	8500	ADQ	ADQ
SR 1811 - NC 38	.65	24	60	12000	1200	2600	ADQ	ADQ
NC 38 - NC 381	2.29	18	60	8000	1000	1900	ADQ	ADQ
SR 1614 (COBBLE RD) SR 1610 - PLANNING BOUNDARY	1.50	16	60	8000	500	1400	ADQ	ADQ
SR 1610 (OLD LAURINBURG RD) US 74 - 1.70 mi E US 74	1.70	22	60	11000	1200	2400	ADQ	ADQ
1.70 mi E US 74 - PLANNING BOUNDARY	.50	20	60	9500	800	1400	ADQ	ADQ
SR 1608 (BOYD LAKE RD/LAKESIDE DR) PLANNING BOUNDARY - URBAN BOUNDARY	2.40	16	60	8000	300	800	ADQ	ADQ
URBAN BOUNDARY - US 74	1.60	22	60	11000	1900	3000	ADQ	ADQ
ROW - RIGHT OF WAY ADT - AVERAGE DAILY TRAFFIC TP - THOROUGHFARE PLAN PROJECT ADQ - ADEQUATE TIP - TRANSPORTATION IMPROVEMENT PROGRAM PROJECT								

TABLE C2 cont'd

MAJOR THOROUGHFARES FACILITY & SECTION	EXISTING X- SECTION			CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	DIST mi	RDWY ft	ROW ft				RDWAY (ULT)	ROW (ULT)
SR 1639 (SPRING ST) NC 177 - 0.15 mi W NC 177	.15	22	60	11000	3800	7000	ADQ	ADQ
0.15 mi W NC 177 - US 74	.60	20	60	9500	3800	7000	ADQ	ADQ
SPRING ST US 74 - NC 177	.50	--	--	11000	5100	8000	TP	TP
SR 1640 (WIRE GRASS RD) CIRCLEWOOD DR - US 1	4.30	22	60	11500	4500	6300	ADQ	ADQ
CAROLINE ST/COLE AV GREENE ST - US 1	.71	--	--	11000	1300	2500	TIP B-3365	TIP B-3365
SR 1624 (COUNTY HOME RD) SR 1646 - NC 177	4.03	20	60	10500	4500	7800	ADQ	ADQ
SR 1903 (MCDONALD AV /BEAUNIT AV/MILL RD) SR 2007 - 1.00 mi W SR 2007	1.00	20	60	9500	1500	2200	ADQ	ADQ
1.00 mi W SR 2007 - 2.20 mi W SR 2007	1.20	24	60	12000	7070	11000	TIP R-512	TIP R-512
2.20 mi W SR 2007 - US 1	2.14	21	60	9500	7500	12200	TIP R-512	TIP R-512
SR 1909 (HYLAN DR) NC 177 - SR 1903	1.90	24	60	12000	4000	6500	ADQ	ADQ
SR 2007 (ALEXANDER DR) SR 1903 - SR 2028	.08	--	--	11000	--	--	ADQ	ADQ
SR 2028 (OAK AV) SR 2007 - SR 1811	1.16	--	--	11000	970	1900	ADQ	ADQ
HAMLET AVE RALEIGH ST - NC 38	.44	--	--	11000	--	--	ADQ	ADQ
ROW - RIGHT OF WAY ADT - AVERAGE DAILY TRAFFIC TP - THOROUGHFARE PLAN PROJECT ADQ - ADEQUATE TIP - TRANSPORTATION IMPROVEMENT PROGRAM PROJECT								

TABLE C2 cont'd

MAJOR THOROUGHFARES FACILITY & SECTION	EXISTING X- SECTION			CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	DIST mi	RDWY ft	ROW ft				RDWAY (ULT)	ROW (ULT)
ENTWISTLE ST (HMLT) SR 1903 - SR 1909	.25	--	--	11000	--	--	ADQ	ADQ
SR 1834 (RICE ST) SR 2028 - US 74 (via HIGH ST)	.59	--	--	9500	2800	4000	TIP B-3380	TIP B-3380
GREENE ST US 1 - US 74	.85	--	--	11000	4350	8100	ADQ	ADQ
SR 1992 (STOKES RD) SR 1108 - SR 1900	2.80	18	60	8000	1000	1750	ADQ	ADQ
SR 1475 (MCDONALD CHURCH RD) US 1 - PLANNING BOUNDARY	1.20	18	60	8500	1100	1800	ADQ	ADQ
SR 1643 (WASHINGTON ST EXT) SR 1646 - SR 1640	2.94	24	60	12500	3000	6100	ADQ	ADQ
SR 1497 (EAST WASHINGTON ST) US 1 - SR 1646	.89	30	60	12000	6700	10000	TP	TP
SR 1400 (WEST WASHINGTON ST) HANCOCK ST - US 1	.21	--	--	11000			ADQ	ADQ
SR 1641 (CLEMMER RD) US 74 - 0.90 mi N SR 1624	1.53	20	60	10500	2500	4200	ADQ	ADQ
BILTMORE DR SR 1903 - US 74	.61	20	--	9500	9800	15100	TIP R-2501	TIP R-2501
S CHURCH ST SR 1966 - SR 1903	.75	18	--	8000	2900	5000	ADQ	ADQ
SR 1939 (HANNAH PICKETT ST) SR 1903 - SR 1966	.53	18	60	8000	2400	5000	ADQ	ADQ
ROW - RIGHT OF WAY ADT - AVERAGE DAILY TRAFFIC TP - THOROUGHFARE PLAN PROJECT ADQ - ADEQUATE TIP - TRANSPORTATION IMPROVEMENT PROGRAM PROJECT								

TABLE C2 cont'd

MAJOR THOROUGHFARES FACILITY & SECTION	EXISTING X- SECTION			CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	DIST mi	RDWY ft	ROW ft				RDWAY (ULT)	ROW (ULT)
SR 1136 (EASON DR) SR 1103 - SR 1971	.74	18	60	8500	600	2000	TP	TP
SR 1130 (YATES ST) SR 1124 - DEAD END	.24	16	60	7500	100	150	TP	TP
SR 1117 (QUARRY RD) SR 1109 - 0.50 mi E SR 1119	1.67	20	60	9500	1000	1700	ADQ	ADQ
0.50 mi E SR 1119 - 1.10 mi E SR 1119	.60	16	60	7500	1000	1700	ADQ	ADQ
1.10 mi E SR 1119 - SR 1124	.60	22	60	11000	1000	1700	ADQ	ADQ
SR 1124 (MIDWAY RD) US 74 - SR 1130	1.64	18	60	8500	600	2000	TP	TP
COLE AV - US 1	.13	18	60	8500	600	2000	TP	TP
SR 1140 (OLD CHARLOTTE HWY) US 74 - US 74	3.10	18	60	8500	450	800	ADQ	ADQ
McNAIR ST US 74 - US 220	.83	--	--	8000	3200	5100	ADQ	ADQ
SR 1109 (ZION CHURCH RD/1st/LEDBETTER ST) US 74 - 1.42 mi S US 74	1.42	22	60	11500	1400	2000	ADQ	ADQ
1.42 mi S US 74 - 2.82 mi S US 74	1.40	18	60	8500	1220	2000	ADQ	ADQ
2.82 mi S US 74 - SR 1113 (LEAR ST)	.35	20	60	10500	1220	2000	ADQ	ADQ
SR 1113 - SR 1108	1.17	22	60	11500	3300	5100	ADQ	ADQ
ROW - RIGHT OF WAY ADT - AVERAGE DAILY TRAFFIC TP - THOROUGHFARE PLAN PROJECT ADQ - ADEQUATE TIP - TRANSPORTATION IMPROVEMENT PROGRAM PROJECT								

TABLE C2 cont'd

MAJOR THOROUGHFARES FACILITY & SECTION	EXISTING X - SECTION			CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	DIST mi	RDWY ft	ROW ft				RDWAY (ULT)	ROW (ULT)
SR 1103 (OLD CHERAW HWY/RIVER RD)								
SR 1124 - 3.14 mi S SR 1124	3.14	22	60	11500	3000	6000	ADQ	ADQ
3.14 mi S SR 1124 - BRIDGE	1.96	20	60	11000	600	1500	ADQ	ADQ
BRIDGE - PLANNING BOUNDARY	1.00	16	60	7500	600	1500	ADQ	ADQ
SR 1648 (ROCKINGHAM RD)								
US 1 - US 74	1.64	26	60	12500	10000	17000	60 (N)	100
SR 1420 (RANDOLPH ST)								
US 1 NBL - CONVINGTON ST	.50	--	--	11000	900	2000	ADQ	ADQ
HAMER RD								
ASLINGTON ST - BUNKER ST	.40	--	--	8000	700	1000	ADQ	ADQ
SR 1441								
SR 1442 - PLAN BDRY	.80	22	60	12000	1800	3400	ADQ	ADQ
SR 1442 (LEDBETTER RD)								
US 1 - SR 1489	.30	18	60	9000	2950	4400	ADQ	ADQ
SR 1489 - LEDBETTER LAKE (BRG)	2.20	22	60	12000	1900	3600	ADQ	ADQ
LEDBETTER LAKE - SR 1489	1.15	18	60	9000	1000	3500	ADQ	ADQ
SR 1423 (RICHMOND RD EXT)								
SR 1442 - NCL ROCKINGHAM	1.60	22	60	12000	1000	2050	ADQ	ADQ
NCL ROCKINGHAM - US 1	1.77	24	60	12500	3000	5300	ADQ	ADQ
ROW - RIGHT OF WAY ADT - AVERAGE DAILY TRAFFIC TP - THOROUGHFARE PLAN PROJECT ADQ - ADEQUATE TIP - TRANSPORTATION IMPROVEMENT PROGRAM PROJECT								

TABLE C2 cont'd

MAJOR THOROUGHFARES FACILITY & SECTION	EXISTING X- SECTION			CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	DIST mi	RDWY ft	ROW ft				RDWAY (ULT)	ROW (ULT)
SR 1645 (MT OLIVE CHURCH RD)								
SR 1643 - US 1	.77	18	60	8500	600	1000	TP	TP
SR 1682 (PATTERSON RD)								
SR 1643 - US 1	.65	18	60	8500	300	800	ADQ	ADQ
PHILADELPHIA RD								
US 1 - ABERDEEN RD	.55	--	--	8000	500	1500	ADQ	ADQ
ABERDEEN RD								
US 1 - PHILADELPHIA RD	.66	--	--	8000	1100	2000	TP	TP
SR 1424 (SANDHILL GAME MGMT RD)								
SR 1445 - 1.40 mi S SR 1445	1.40	22	60	11500	3200	4450	ADQ	ADQ
1.40 mi S SR 1445 - 1.99 mi S SR 1445	.59	18	60	8500	3200	4450	ADQ	ADQ
1.99 mi S SR 1445 - SR 1423	.57	22	60	11500	3200	4450	ADQ	ADQ
SR 1431 (NICHOLSON ST)								
SR 1424 - SR 1418	2.08	22	60	12000	1140	2000	ADQ	ADQ
SR 1432 (McNEIL RD)								
SR 1431 - SR 1424	1.60	20	60	11000	800	2000	ADQ	ADQ
SNEAD AV								
US 220 - SR 1418	.61	--	--	11000	1100	2000	ADQ	ADQ
SR 1418 (N CEMETERY RD)								
SR 1412 - SR 1336	1.64	22	60	12000	1170	2200	ADQ	ADQ
SR 1412 (NORTHAM RD)								
SR 1418 - ASLINGTON ST	.81	18	60	9000	1170	2200	ADQ	ADQ

ROW - RIGHT OF WAY ADT - AVERAGE DAILY TRAFFIC TP - THOROUGHFARE PLAN PROJECT
ADQ - ADEQUATE TIP - TRANSPORTATION IMPROVEMENT PROGRAM PROJECT

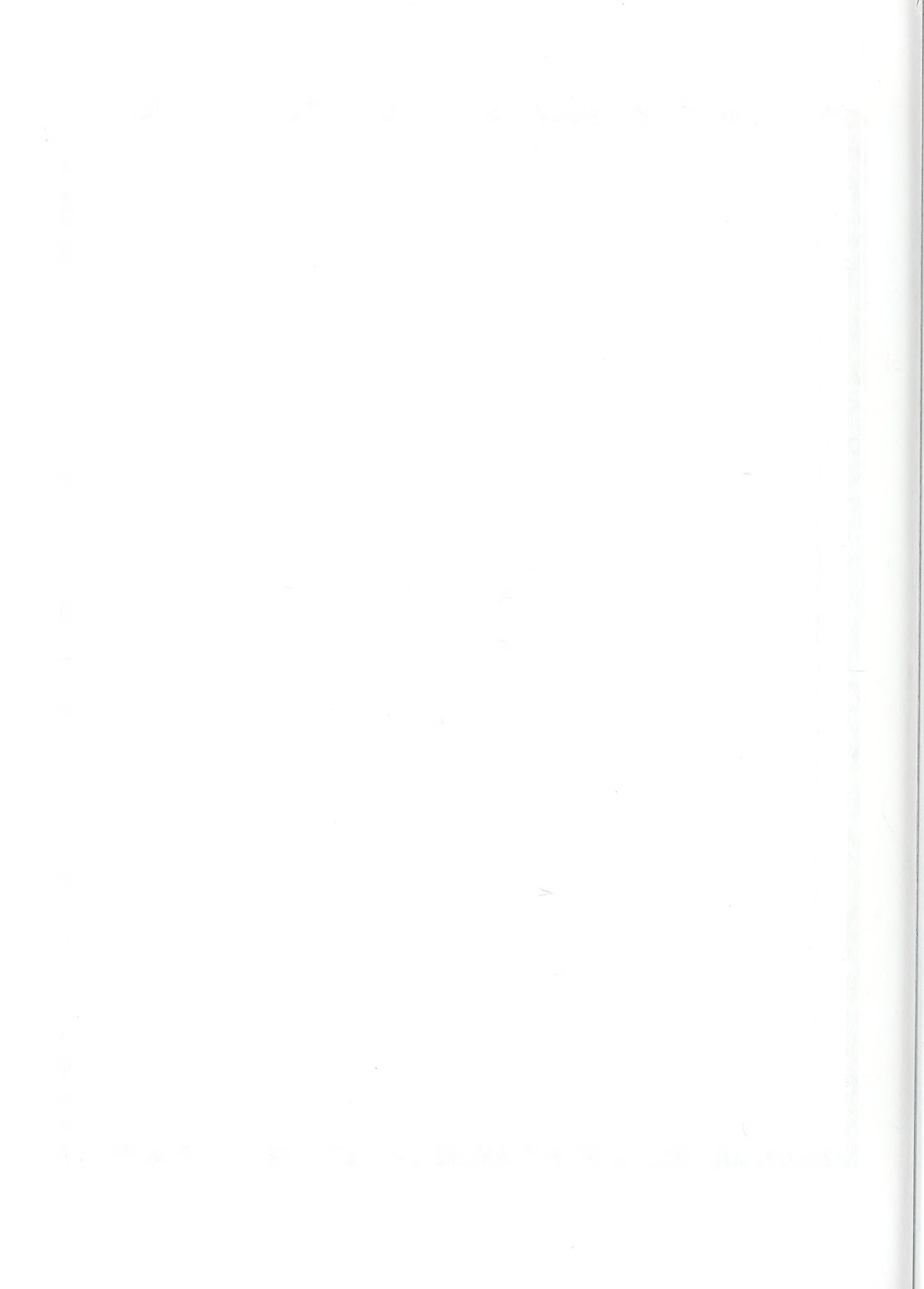
TABLE C2 cont'd

MAJOR THOROUGHFARES FACILITY & SECTION	EXISTING X- SECTION			CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	DIST mi	RDWY ft	ROW ft				RDWY (ULT)	ROW (ULT)
ASLINGTON ST US 220 - NORTHAM RD	.71	--	--	11000	2100	3200	ADQ	ADQ
SR 1005 (PRISON CAMP RD) SR 1303 - US 74	2.63	18	60	8500	1300	2100	ADQ	ADQ
SR 1336 (BILLY COVINGTON RD) US 220 - SR 1418	.55	22	60	12000	950	1500	ADQ	ADQ
SR 1650 (LONG DR) SR 1903 - SR 1624	1.02	20	60	9500	6500	9750		
SR 1646 (LONG DR) US 1 - SR 1624	1.26	37	60	16000	16300	22700	60 (N)	100
WASHINGTON ST (HMLT) NC 177 - GREEN ST	.16	--	--	8000	3000	6000	TP	TP
SR 1700 (E.V. HOGAN) NC 177 - DEAD END	.79	22	100	12000	50	200	ADQ	ADQ
RIEGEL RD US 1 - DEAD END	1.30	--	--	11000	250	500	ADQ	ADQ
SR 1424 (ROBERDEL RD) SR 1423 - US 1	1.21	20	60	10500	3200	5100	ADQ	ADQ
SR 1657 (HOOD ST) SR 1497 - SR 1648 (via CLARK ST)	.72	--	--	11000	1200	2500	ADQ	ADQ
PICKETT ST SR 1648 - US 74	.17	--	--	11000	1000	2500	ADQ	ADQ
DAVIS ST (ROCKHM) SR 1966 - SR 1903	.16	--	--					
SR 1419 (STEELE ST) ASLINGTON - US 1	.61	22	60	11500	2000	4000	ADQ	ADQ
ROW - RIGHT OF WAY ADT - AVERAGE DAILY TRAFFIC TP - THOROUGHFARE PLAN PROJECT ADQ - ADEQUATE TIP - TRANSPORTATION IMPROVEMENT PROGRAM PROJECT								

TABLE C2 cont'd

MAJOR THOROUGHFARES FACILITY & SECTION	EXISTING X- SECTION			CAPACITY CURRENT (FUTURE)	1994 ADTS	2020 ADTS	RECOMMENDED X - SECTION	
	DIST mi	RDWY ft	ROW ft				RDWAY (ULT)	ROW (ULT)
SR 1124 (MIDWAY RD)								
SR 1130 - 0.61 mi E SR 1130	.61	24	60	12500	900	2100	ADQ	ADQ
0.61 mi E SR 1130 - COLE AV	.55	18	60	8500	900	2100	ADQ	ADQ
SR 1405 (N LEE ST)								
McNAIR ST - GREENE ST	1.18	18	60	8000	2150	5000	ADQ	ADQ
MANESS AV/4th AV								
US 74 - US 220 (via N LEE ST)	.80	--	--	11000	2000	3500	ADQ	ADQ
ROW - RIGHT OF WAY ADT - AVERAGE DAILY TRAFFIC TP - THOROUGHFARE PLAN PROJECT ADQ - ADEQUATE TIP - TRANSPORTATION IMPROVEMENT PROGRAM PROJECT								

APPENDIX D



APPENDIX D **CONVERSION FACTORS**

TABLE D-1
CONVERSION TABLE

<u>English Units</u>		<u>S.I. Units</u>	<u>Abbreviation</u>
1 inch	equals	25 millimeters	(mm)
1 foot	equals	0.3 meters	(m)
1 mile	equals	1.6 kilometers	(km)
1 acre	equals	2.47 hectares	(hect)

TABLE D-2
METRIC EQUIVALENTS

1 millimeter	equals	0.001 meters
1 kilometer	equals	1000 meters
1 hectare	equals	10,000 square meters

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